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MINING AND SCIENTIFIC PRESS.

Whole No. 2163.—VOLUME LXXXIV. Number 1. SAN FRANCISCO, SATURDAY, JANUARY 4, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

A Use for Silver.

A bill has been introduced into Congress to put an ad valorem tax on imported manufactured silver of 25%. The idea is not protection for the silver manufacturer, but for the silver producer a practical suggestion, looking toward the increasing of the market for the metal in this country. This is what is wanted, not restricted production, hut more use. It is suggested that silver miners become silver manufacturers as well. Attention is called to the fact that the household use of silver could be much extended and popularized if the manufactured articles of tahleware were cheapened in price. Under present conditions the cost of manufacture is higher than need be, and the jewelers who control the sale have high profits. If the silver miners established and operated their own silverware factory, and had a fair manufacturer's profit, silver articles could he sold a third cheaper than at present, and their use enormously extended. It is not likely that the price of silver could be much advanced, hut it could certainly he given an additional demand which would tend to keep it from going lower. Silver miners have ample successful precedent for their suggested entry into the silver manufacturing business. The makers of iron and steel have become their own miners of the iron ores. Miners of zinc, lead and copper have already hegun the manufacture of their metal production into its final consumahle form. At the Lake Superior mines copper wire, copper tuhes and sheet copper are manufactured direct from the finishing melt of the reduction process from the ore. It is reported that at the United Verde mine, at Jerome, Ariz., a copper manufacturing plant has been installed, and that the last melt of the metal in the refinery is used for the manufacture. There is no reason why in the same plant the silver should not from its final refinery melt go directly into spoons, for illustration, instead of into silver bricks. Certainly, with cheapened silver spoons there would be more market for them, and the sale value of silver bricks would, if anything, increase, simply because with more silver spoons manufactured there would he fewer silver hricks manufactured.

Gasoline Locomotive.

Herewith is illustrated the Prouty gasoline locomotive. Gasoline engines are common motors, hut a gasoline locomotive is somewhat of a novelty. They are huilt for mines and tramways in a number of styles and sizes and to haul from 15 to 100 tons, some sizes made to take as narrow as an 18-inch gauge. The amount of load that a locomotive will haul is determined hy its weight, and the condition of the track, grades, curves, etc. The manufacturers furnish a data blank to he filled in and from which they will make an estimate and guarantee the work the locomotive will do successfully under the conditions stated. The particular features in these locomotives are the method of carrying and feeding the gasoline so that it is entirely consumed in the engine cylinder, which prevents the escape of any smoke or odors and lessens the liahility to accidents. The driving and reversing clutches hetween the engine and car axle are so constructed that the engine is run one way without stopping; the car may he started smoothly either way and driven at any desired speed up to the maximum, by one single lever, as seen in the hand of the driver in the illustrations on this page.

The Prouty Gasoline Locomotive.

Prouty Gasoline Locomotive and Train of Ore Cars.

FAITH in the invincibility of what is, against displacement hy the novel, seems less fixed than has been customary. Marconi announces that he has received wireless telegraphic signals across 1800 miles of the Atlantic ocean separating New Foundland from England, and the holders of Atlantic cahle stocks are influenced to sell out on a declining market. An explanation is made that this last announcement hy Marconi would indicate that the curvature of the earth is no bar to his system. This, however, was long since conclusively demonstrated hy communication hetween ships over 30 miles apart. With commercial success already accomplished up to 300 miles distance, experiment is only concerned with overcoming greater distances at sea and the physical ohstacles on land.

THE day of 17-cent copper has passed; that price never had a firm foundation, and when imports hegan it necessarily fell. There will he an equalizing, a lessening of production and a price probahly as low as 10 cents. Michigan, Montana and Arizona copper miners have seen this coming, and most of the larger producers have put themselves in readiness for the inevitable by the accumulation of surplus funds, the construction of new works and the installation of extensive and expensive plants. Copper is now produced at a cost of 6 cents per pound; and even when it sells at 10 cents, the hig producers will he in condition to produce at a profit. In no department of metallurgy has scientific mining made more advance; and, despite gloomy assertions, the copper-producing interest will continue to he one of continuous development and permanent profit.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 4 50

Entered at the S. F. Postoffice as second-class mail matter.

J. F. HALLORAN.....Publisher

San Francisco, January 4, 1902.

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SOME months ago the projecting of a steel making plant in Italy, to use electric power generated from water to reduce the iron ore, was noted. The incident was notable inasmuch as the experts had very elaborately and convincingly demonstrated by their figures that it could not be done on a commercial scale in competition with the advanced methods in use at Pittsburg, Pa. A few days ago the telegraph noted the incorporation of a company to make steel direct from ore in a plant projected at Elizabethtown, Tenn. It is rather startling to find the experts challenged on their own ground. It is hardly to be presumed that the incorporation is not a legitimate business organization to do just what it says it will do, namely, make steel directly from iron ore by the electric current as a commercial proposition. One ounce of commercial demonstration will overturn mountains of theory. In this case the commercial possibilities that the ounce of commercial demonstration will open up are dazzling. Cheap as iron and steel now are, they will become still cheaper, since their production from the ore can be made so near to the point of consumption of the metal that the cost of transportation can be largely eliminated.

THE year 1901 was notable for the number of great metallurgical installations made in the United States. The year 1902, just beginning, will hardly see a duplication of these great plants, but will be very likely to witness the installation of a great number of metallurgical plants of moderate size. High efficiency and economy of cost can be obtained in plants of moderate capacity as certainly as in the very large ones. The latter will not have a monopoly of metal production simply because they are very big. Mine owners this year, with lowered prices for silver, lead and copper, in order to maintain the production and profit earning power of their mines, must reduce the cost charges against their ore production. Modern, up-to-date metallurgical plants of moderate capacity, operated as part of the mine plant, offer the best chance to make the cost reductions. With gold mining of free milling ores the practice of making the mill part of the mining plant is established as a custom. The idea of doing the mining only and giving the profit of the milling to another hardly receives consideration now. There seems much reason to anticipate that the current year will see the development of the same practice into a fashion with mines where the ores require smelting and subsequent refining. Both smelting and refining are commercially possible with small plants. While it may be that some direct costs will be increased, the indirect ones that will be eliminated or reduced will be found to offset the increases. That the installation and operation of metallurgical plants as part of the mining business involves some addition of risk is inevitable. A better knowledge of the business reduces, however, the risks that a few years ago were often prohibitive, and there is compensation for risks in the profit that success insures.

Smelter for the Cœur d'Alene Mines.

It is reported that the silver-lead miners of the Cœur d'Alenes, Idaho, are planning to jointly build a great smelting plant to reduce the ores from their own mines, in order to get the smelting profits now realized by the smelting monopoly. As a fact, the contemplated action is based on broader grounds than the simple predatory impulse stated above. Lead smelting is naturally a subordinate detail of the business of lead mining. The existing relations practically reverse this and make an unnatural relation. The lead miners—more exactly, the lead-silver miners—do not control their own investments. The smelter monopoly makes sale prices and imposes contract terms regulating the mining, buys lead ore or declines to buy—all from the standpoint of interest, regardless of the miner or his investment. The market value of the latter is as absolutely controlled by the smelters as is their own investment. It is impossible that such a condition could endure permanently. Either the smelters would take over the actual ownership of the mines on their own terms as to price, or the mine owners would build their own smelters. It is to be hoped that the Cœur d'Alene miners carry out their stated intention and build their own smelter. Other lead-silver mining miners would undoubtedly follow the example. Indeed, they would have to, to continue to exist. It is practicable to effect a community of interest organization for the smelting works which will leave the individual operation of the mines absolutely free and untrammeled, except by the common commercial restrictions imposed by the market price of the metals. While the Cœur d'Alene miners are building their smelter plant they should not miss the opportunity of being up-to-date, or, indeed, of making a new date. They can add the manufacturing machinery at a comparatively insignificant additional investment, and turn the lead from the ore directly into lead pipe and the silver into silver spoons.

The Value of Mine Accounts.

The superintendent's report, and the bookkeeper's balance sheet and profit and loss account of a large mining enterprise are instructive and suggestive reading for the managers of small mines. The latter are apt to regard the operations under their charge as too small in detail to warrant the cost of systematizing and detailing the outlay and income. Bookkeeping is rather looked on as a sort of necessary evil to be endured and not to be made more complex than simple entry or the simplest kind of entry would require. If the mine pays the bookkeeping that tells how it does it is considered rather trivial, and if it does not pay economy is likely to begin with the bookkeeping department.

To dispel this indifference a careful reading of the superintendent's reports and the bookkeeper's statements of the great mines that have been made great by little profits from low-grade ores can be suggested. An imitation of the methods of these great mines can hardly fail to bring a greater measure of commercial success to the small mines. In looking over the accounts it will be noted that no item of expense is regarded as trifling. Each in proportion to its dollars is charged against the ore, the raw material the mine produces. On the other hand, no source of income is regarded as too small to be included as adding to the output in value of the raw material, ore. There are no avoidable wastes permitted to show through successive years in these profit and loss accounts. The superintendent with the profit and loss account and its details is enabled to intelligently examine each for possible gains by economy or change.

Condensed statements are of more limited value than fully detailed ones. The parts that make the whole cannot be guessed at successfully, and while such condensed statements may on the face, and by comparison with the condensed statements of similar operations, seem satisfactory and intelligible, the details fully stated may tell an entirely different story as to the particular operation they record.

Long Distance Electrical Transmission.

Successful long distance electric power transmissions, so numerous in the Western States, particularly California, seem still to be a surprise to Eastern electrical engineers and investors, while accepted as a matter of course by their builders and people here. This difference in the view point is not wholly explicable. In these days nothing that is new remains a novelty very long. It is not so many years since the discovery of the Roentgen rays was announced. Now, nickel-in-the-slot machines on the street corners offer Roentgen rays to the passer-by who wishes to see what his bones look like.

So it has been with long distance electric power transmission on the Pacific coast. Engineers on the Pacific coast, more than ten years ago, began to regard the lately accomplished long distance electrical transmission of the water power of the Sierra Nevada mountain streams as simply a matter of commercial detail. It would be accomplished whenever it could surely be anticipated to pay. In the then state of the art of long distance electrical transmission of power it would not have paid commercially. The art, meanwhile, has advanced. It does pay commercially now because advanced knowledge has made it possible to reduce installation costs. The long period during which anticipation discounted accomplishment robbed the latter of novelty to some extent. Perhaps the instinctive professional feeling of engineers that this enormous natural energy of falling water going to waste was unnecessary was the inspiration to the effort to reclaim it. The Eastern electrical engineer and capitalist see only the end, the spectacle and the solid fact of success that accomplishment has provided.

What is done can be done again. The long distance transmission which is, here in the West, can be, in the East. Commercially, the problem is not quite so simple. Population and industry are distributed more evenly and over wider areas in East, and the sources of power are closer to the market for it. Transportation is not as large an economic waste, measured by its ratio to the other elements which constitute the cost of production. Yet, even with these differences, the economic tendency to increase the profits of production by reducing ever so little the cost will result in long distance electric power transmission there as here.

The sources of prime moving energy are not likely to be the same. The unit cost of power development from low heads of water is much more than from high heads. The former cannot compete in cheapness with cheap coal at the pit mouth. Improvements in transforming the latent energy of coal into work are being constantly made, and there is still a large margin to reward successful further improvement. Statements have been made that the Mond process for making fuel gas from coal at a cost of 4 cents a thousand feet has been improved on in the United States by the invention of a process which produces a better fuel gas at a cost of 2 cents a thousand feet. The transportation cost for coal from the pit mouth to the consuming furnace has been decreased some, but to nothing like the extent either absolutely or in ratio. It would seem as if, commercially, the copper wire was cheaper than the railroad for the transportation of energy up to 230 miles, if not to even greater distances.

The measure of commercial success that is attending long distance power transmission on the Pacific coast can be appreciated from authorized figures lately published by the Bay Counties Power Co. in California, the distance of transmission from the water power to points of use ranging from 80 to 220 miles. The gross earnings for April, 1901, were $13,913.21, expenses $4466.35, net earnings $9446.86. These have steadily increased each successive month. In September, 1901, they were: gross earnings $25,463.52, expenses $6804.59, net earnings $18,598.93. Contracts are signed, and await only the connecting and motor installations, providing $15,000 additional gross earnings monthly, and the remaining already developed power will bring $10,000 additional monthly. The total gross earnings will then be $50,000 monthly, with not more than $9000 monthly expense, leaving about $41,000 monthly net earnings.

Concentrates.

THE three metals, sodium, potassium and lithium, are lighter than water.

THE loss of quicksilver in a gold mill varies from one-fourth ounce to one-half ounce per ton of ore treated.

THE average depth of machine-drilled holes in tunnel headings is about 5 feet, depending on the size of the tunnel and the hardness of the rock.

A BAR OF IRON increases in length when first magnetized, but upon increase of the magnetizing force the effect is reversed and the bar shortens.

THE rise in the price of the Brazilian carbonado, or black diamond, has in most cases increased the cost of diamond drilling from $1.50 to $4 a foot.

TO FIND the weight of a grindstone, square the diameter in inches, multiply by the thickness in inches, and multiply this product by the decimal .06363.

THE pressure developed by fulminate of mercury is estimated at 193 tons to the square inch, nitro-glycerine 86 tons, gun cotton 71 tons, blasting powder 43 tons.

"CHEAP" labor is not profitable labor. Usually the "cheaper" the more worthless. The man or mine dependent solely on cheap labor will find it the dearest in the long run.

TO amalgamate rusty or greasy gold use a solution of equal parts of cyanide of potassium, sal-ammoniac, sodium and oxide of manganese. Add sufficient water to make a weak solution.

A GOOD PROTECTION for hoist cables against corrosive mine waters is a mixture of pine tar and tallow applied hot. The proportions are five to eight gallons of tallow to a barrel of tar.

A "NATIVE AMALGAM OF SILVER WITH MERCURY" is not wholly unknown. It is found in some widely divergent localities, notably in largest quantity in the silver mines of Coquimbo, Chile, S. A.

THE lessees in a mining lease may remove railroad tracks placed by them, where such removal causes no material injury to the freehold and where the lease is silent as to the right of removal.

EXPERIMENTS are considered to have fully demonstrated that steel making furnaces can be kept as hot and the steel made as quickly by the use of oil as when gas is used. From nine to ten hours is required for heat.

IN a pipe 12,600 feet long, 6 inches diameter, head 200 feet, the water will attain a velocity of 4.26 feet per second. This multiplied by the area in square feet of a section of the pipe gives the discharge per second in cubic feet.

THE term "bushel" is not recognized west of the Rocky mountains, and there is no standard weight of charcoal per bushel in California, but a "bushel" of charcoal made from oak wood will weigh forty pounds; from pine thirty pounds.

THE refining of copper by the electrolytic method is certain to show platinum if it exists. It would be thrown down with the gold and silver and in the subsequent treatment, not becoming dissolved by the acids used or slagging off, it would be left with the gold and disclosed by assay.

THE electrical reduction of aluminum by the Heroult electrical process consumes about 20 kilowatt hours of electric power to the pound of aluminum produced. This includes all the power used about the reduction works and not merely that of the current directly effecting the reduction.

COPPER OR LEAD in small amounts can be removed from mercury by putting it under warmed diluted nitric acid, stirred at intervals of one-half hour for four hours. Lead in larger quantities is removed from mercury by retorting, the mercury being covered to the depth of about 1½ inches with powdered charcoal.

THE Supreme Court of Montana, in the case of McShane vs. Kenkle, ruled that the finding of mineral in the rock in a claim constitutes the act of discovery as contemplated by the U. S. mining statutes, nor is it necessary that the mineral should be found in payable quantities at the place and time of discovery.

THE reported rates of tunnel heading advance daily in the Simplon and other railroad tunnels through the Alps include the advance in both headings. Dividing it between the two, the daily advance in a single heading has been about the same, 8 feet to 10 feet, that has been accomplished in the mine tunnels in the United States.

WHILE it is desirable to have a margin of safety against bursting from pressure in hydraulic mining pipes, the margin need not be as large as required for more permanent constructions. A safety factor of 1.75, or even 1.5, will be ample and will prove quite an advantage where transportation costs are high, as a thinner iron can be used.

IN Montana a cubic foot of water (7.48 gallons) per second of time is the legal standard for the measurement of water. Where water rights expressed in miner's inches have been granted, 100 miner's inches is there considered equivalent to a flow of 2½ cubic feet (18 7 gallons per second); 200 miner's inches equivalent to a flow of 5 cubic feet (37.4 gallons) per second, etc.

GOLD AND SILVER can be refined by electrolysis. The process is much the same as that employed in the refining of copper. Thin plates of pure gold or silver are used as the cathode, and on the passing of the current the gold or silver is deposited at the cathode and the impurities either remain in solution or are deposited as the anode sludge. Palladium and platinum impurities in crude bullion from some placer gold are separated from the gold by this electrolytic process and can be recovered from the sludge without much difficulty. The plant required is not large.

THE horse power, the quantity of work required to raise 33,000 pounds 1 foot in one minute, denoted by the symbol H. P., is referred to now as the mechanical horse power, with a symbol written M. H. P. to distinguish it from the electrical horse power, or kilowatt, for which the symbols E. H. P. and Kw. are employed. The electrical horse power is a mechanical horse power multiplied by 1.34048. Electric generators are estimated in kilowatt units and electric motors in M. H. P. units.

IF too much gasoline is being fed to the cylinder of a gasoline engine there is a great deal of smoke and soot formed by the unconsumed fuel. This deposits on the electrodes, causing failure to spark and there is no ignition. If there is an auxiliary exhaust port soot deposits in this and, mixing with the lubricating oil, forms a gummy, sticky mass, partially or entirely filling up the port and causing back pressure in the cylinder. All the burned gas may not escape, and what remains fouls the incoming charges, so that very weak explosions result and many of the charges do not ignite at all.

THE electric arc used in welding and in blast furnace chills has not, so far as "Concentrates" is advised, been applied to the work of an assay furnace. This last has its special conditions differing from the conditions of the other uses. But there is no reason why trials should not be made till the application of electric heating to assaying and cupelling is successfully made. The possible advantages certainly justify the risk of the cost of the experiments. The electric arc has been successfully applied to the equipment of crucible fusion in the manufacture of aluminum and other metals.

WHEN a secondary or accidental vein crosses a common side line between two mining claims at an angle, and the apex of the vein is of such width that it is for a given distance partly within one claim and partly within the other, inasmuch as neither statute nor authority permits a division of the crossing part of the vein, the rights of the parties will be determined by the priority of location and the entire vein considered as apexing upon the senior location until it has wholly passed beyond its side line, without regard to the direction in which the vein dips, was the rule made by the United States Supreme Court in the case of the St. Louis M. & M. Co. of Montana vs. Montana M. Co., Ltd.

THE responsibility of partles who grubstake a prospector for the expenses incurred by the latter depend on the nature of the agreement between them. If the prospector finds and locates claims, the parties to the agreement become co-owners, but not partners, except by special agreement, in that claim, in respective shares as declared by the terms of the grubstake agreement. Co-owners are responsible for the expense of work on a claim which they authorize. One who as superintendent or agent of the co-owners employs labor on the claim obligates the co-owners to pay for that labor. A grubstake agreement makes an agent with special powers limited to the specific terms of the agreement, verbal or written. Unless specifically authorized by the agreement, the one grubstaked cannot hire labor and incur expenses which become an obligation against the grubstakers.

ERRORS in the patent surveys of mining claims have been corrected after patent has been issued. In one California case the United States deputy mineral surveyor returned the side lines of a survey NW and SE where these lines actually had bearings NE and SW, and returned the end lines NE and SW where the real bearings were NW and SE. The error was discovered by another deputy mineral surveyor in making the official survey of an adjoining claim. The Surveyor General issued instructions to the last deputy to resurvey the claim patented on the erroneous survey and corrected it on the official land office maps. The adjoining claim was surveyed in accordance with the corrected survey. The principal source of error in such surveys arises from carelessness on the part of the surveyor in making connections with the section and quarter section corners and in making connections with the corners of previously approved mineral surveys. Too much of the practice of the early surveyors consisted in measuring these connections on paper on the theory that the sectional surveys were correct—that the preceding surveyor had actually done the work represented to be done. As a consequence errors once started have been carried into a more or less considerable group of surveys.

GOLD does not sift its way through the unconsolidated material with which and on which it is deposited so as to accumulate and make a placer at the bottom on bedrock. On clean bedrock that contains seams it works its way downward through the water removing the silt under the gold and allowing it to sink deeper. Gold would sink through quicksand, but not through merely wet sand, which packs hard when wet. In old channel deposits it is often noted by miners that the pay is in one or more layers or strata, often well above the bedrock. So far as the drift material in and on which it rests, no physical difference can be noted which, permitting the gold to sink through the overburden of the gold-bearing stratum, would not permit it to continue sifting downward until it was collected on the bedrock. The fact is that, once covered from the direct action of the water, the fine particles of gold stay where they are put before they are covered up. Water, however, by removing the unconsolidated material, permits the gold to fall, not sift, lower. A large number of such successive removals of the barren rocks and other wash will accumulate the gold into one stratum, which more often than otherwise is on the bedrock and makes the placer.

IRON ore deposits originate in several modes. Where an assay shows the presence of gold it is a fairly safe inference that the iron ore is the result of the oxidization of what was originally a deposit of auriferous iron pyrite which may or may not have carried copper as well. It will probably disclose itself when the zone of permanent water level is reached, whether or not copper bearing. Here, if it is copper bearing, will be collected as native copper, oxides, carbonates or high-grade sulphides, the copper mineral that is not disclosed at the surface. Below this zone will be found the pyritic sulphides, unaltered save for a gradually diminishing secondary sulphide formation. The richness of the iron ore in gold is not an indication as to the probable richness of the unaltered pyritic minerals. It is, if anything, merely an indication of the extent to which surface concentration has taken place. The richer in gold the iron ore, the greater the concentration it represents. It is advisable to explore such gold-bearing iron ore deposits to depth. There may be a good copper mine underneath. Also the pyritic ore if not so rich in gold is rather more cheaply reducible. The iron ore can only be made to yield its gold by using it as a flux with other ores, which involves the expense of transportation. The pyrite can have its values concentrated by smelting to a grade which will be rich enough to pay transportation costs and still yield a satisfactory profit.

CYANIDE SOLUTIONS from leaching tanks contain free cyanide, caustic potash, gold potassium cyanide, silver potassium cyanide and compounds of baser metals. The gold and silver are precipitated from the solution by means of zinc shavings or zinc dust as a blackened powder on the zinc, the latter metal going itself into the solution. During the process hydrogen gas is evolved, bubbling to the surface. From five ounces to one pound of zinc are ordinarily required for every ounce of gold recovered. In cleaning up the zinc box, the blackened, undecomposed shavings of the first box are transferred to an iron pan; the gold slimes remaining on top of the screen are stirred to make them pass through, after which the screen is removed and washed. The cock at the bottom of the compartment is opened, the slime settled there drawn off into a bucket, where it again settles, after which the clear cyanide is decanted and returned to the zinc box. The collected slime is put in a filter, drained of cyanide and washed with water. The slime consists of metallic gold, silver and copper precipitated from the cyanide. In refining the precipitates they are put in a cast iron pan and subjected to a dull red heat in a muffle furnace. When the roast is complete, the precipitate is treated with hydrochloric acid in pans having mechanical agitators. The residue is washed and dried in filters, fluxed and replaced in the roasting pan, and afterwards smelted into a bar or brick.

BEFORE smelting works are definitely decided on, several points should be settled. First, a supply of ore should be in sight that will suffice to run the smelter for a couple of years. The mere fact of having plenty of copper or lead ore in sight is not sufficient. Other elements enter into the composition of the ore that will enable successful work to be done. If these are absent from the ore, the deficiency must be supplied by obtaining them elsewhere and adding them as fluxes. Again, the question of water is a very important one, especially in the case of a water jacket furnace. There arises the all-important question of fuel, the neglect of which has been the ruin of many a plant. In the coke of this coast there is usually a very large amount of ash—about 14%, or even more—although first-class coke for smelting should not contain over 8%. Smelters are often built to perform only the first operation, the preliminary concentration of the metal in matte, which is subsequently shipped to a refinery elsewhere. This point, whether a refinery should be built in connection with it or not, is a matter which requires careful consideration. The cost of fuel, railway transportation charges and the available capital, are the matters which will enter into the decision as to this. Suitable ground must be found for the works, where gravity may be utilized to carry the material from its point of delivery into the works to the point where the finished product is to be delivered into the cars for shipment at the lowest level, as it is in saving a few cents at different points that the profit is to be made. Handling the slag is a more important item than many imagine. At first, when there is no great length to carry it, this is a small matter; but with a smelter turning out 100 tons of slag daily, the dumps very soon grow and the haul becomes a large one. Pouring into a stream of water, and thereby granulating it so that the rounded particles can easily be carried away, is a good method. The manager of the smelter should be a man who has long experience in such works, and not, as is often the case, a successful grocer or sea captain; and he must have a good analytical chemist, on whom he may rely, in charge of the assay office, as unless he knows the composition of the ore he is dealing with day by day, he cannot so mix his charges as to obtain a perfect saving.

Quicksilver.*

By R. S. Baverstock.

Hydrargyrum, meaning "water-silver," a Græco-Latin name for quicksilver, is evidence to us that this metal was not unknown to earlier races. Pliny, who lived about 40 A. D., named it "minium," a term in late years applied to "red lead" by the Saracens. Paracelsus tells us of the use of quicksilver in medicine, and 300 years B. C., Theophrastus mentions it as a derivative of "cinnabar." This much for its history in Europe. On the American continent its use and the knowledge of its existence are of greater antiquity. The Indians, in places where the metal occurs in California, were found by the "white man" decorated with vermillion paint made from (quicksilver) rock. Going southward through Mexico into Peru, a country whose ancient civilizations are only just being brought to light, one can safely reason that with the knowledge and capabilities shown by those race builders of early days, quicksilver along with other minerals received its fair share of their attention. Undoubtedly much of the wealth won from the earth, by such races as the Incas, Aztecs, and later by the Spaniards, was secured by the aid of quicksilver from the Peruvian mines. Even up to the year 1700 these Peruvian mines held the first place for production of the metal, which after that period began to rapidly decrease, and Spain, followed by Austria as second, began the transference of the banner production from South America to Europe. Within the last fifty years North America has entered the field, wresting second honors from Austria and steadily overhauling Spain. The order of production is now:

Spain, 38%; United States, 28%; Austria, 13%; Russia, 10%; Mexico, 6%; Italy, Peru and others furnishing the balance.

Occurrence.—Quicksilver is found in very many countries, but in few only in paying quantities, among which are Peru, Mexico, Brazil, California, Oregon and Texas on the American continent; Spain, Russia, Austria, Italy in Europe; Australia, New Zealand, Borneo, China and Japan. The principal producers have been enumerated.

The various deposits are by no means confined to one formation; the following are some of the different occurrences: In Spain, at the Almaden mines, the deposits occur in the Silurian rocks, in sandstone and quartzite interstratified with slate and limestones; in America (California), in metamorphic rocks—serpentine and sandstone; in Austria, among rocks of the Triassic period; in Russia, Carboniferous; in Italy, in the Tertiary; in Mexico and China, in limestone; in New Zealand, in andesite.

The most frequent occurrence of the mineral is in form of a sulphuret—cinnabar—easily distinguished by its handsome and attractive appearance, being a rich vermillion color when scratched with a knife. Its presence in the rocks is attributed to deposition from solutions. It is not infrequently found in combination with other metals—in California, Colombia and Coquimbo with gold and silver, and in Europe with zinc blende.

A black sulphide is also found, known as metacinnaharite; also a liver-colored form of cinnabar. In small quantities, imprisoned in the rock in fine globules, it occurs native. It sometimes occurs in chloride form as horn mercury or calomel, and as selenide and sulpho-selenide.

Characteristics.—Quicksilver is the only metal that has the property of remaining fluid at ordinary temperatures. It freezes at —30°, forming a ductile tin-white metal.

The specific gravity of mercury is 13.59. It vaporizes slowly at ordinary temperatures, boiling at 360°. It has a great affinity for other metals, chiefly gold, silver, copper, etc., and these properties have been turned to account with much profit in metallurgy.

Production.—The largest mine worked to-day is the Almaden mine in Spain, which has been worked almost continuously for 2400 years. This mine alone produces almost one-third of the world's production. So valuable is the property that when Spain needed money during the late war with this country, European financiers advanced the Government considerable money, being secured by a concession to operate the Almaden mines. The ores worked in the early days are said to have averaged nearly 40%. They have decreased in percentage until to-day 8% ore is considered quite good. It is in this respect a better grade of ore than is run anywhere else, the average run in Austria being 0.8%, Russia 1%, Italy 1.2%, California 1.3%.

The mines of Italy were first worked by the Etruscans, the Russian mines by the Greeks, the Peruvian mines by several successive races, the Spanish mines by the Moors. Some work in China has been carried on for many years; the mines situated in the province of Kivei Chaw are now being operated by a French company. During the war, however, work was suspended.

A few references to the smaller deposits may as well be made at this point; the larger deposits of Spain, Austria, Italy, Russia and California will be treated later.

In Mexico, the production does not nearly supply the demand of the mines, and quicksilver has to be imported. Like other countries, the mines have been stripped of their high-grade ores, and only at the present time, with improved furnaces, are the immense deposits of low-grade ore receiving attention. The chief mines are at Huitzuco, where the cinnabar occurs in sandy, clayey formation in fissures. These radiate out in pipe-like form from nuclei, generally in the cones of small upheavals (a similar occurrence is noted in San Luis Obispo county). The rich streaks were first extracted and retorted in a crude way, only about 50% of the metal being recovered. In later years, however, furnaces have been erected and the low-grade ores worked. From 1886 to 1890 1.01% ore was worked, average price $70; from 1890 to 1893 .91% ore was worked, average price $75; from 1893 to 1896 .62% ore was worked, average price $65 to $91. Besides the increase in price, the production has steadily improved.

At Guadalcazar, north of San Luis Potosi, an English company is working a small deposit. The ore occurs in veins and pockets of gypsum. It averages well, running from 2% to 3½%. In distilling about 85% is recovered.

Peru.—The greatest mines in Peru are at Huancavelica. The production is nominal to what it used to be. Prior to 1700, Peru led the world in the production of mercury, having a greater record than even Spain. Undoubtedly the rich silver mines of the Aztecs and the Incas were supplied with the quicksilver produced in the Peruvian mines. Now, however, they produce only a few tons per month.

But little is known of the Brazilian deposits, and also those of Madagascar. Borneo has a production of some 1600 flasks annually, equal to that of Texas. This covers the minor deposits of the world, with the exception possibly of Hungary, where quicksilver is extracted as a by-product from the spathic iron ores.

Methods of Reducing Ores at Almaden, Spain.—There are three principal deposits, which extend about 200 yards along the strike of the vein. They are regarded as being 40 feet in width and averaging 10% Hg. The mines, of course, after so many years exploitation have a large amount of development work accomplished. They were worked by the Moors and have always been a source of great revenue to the country. In the early days the rich seams were worked—the high-grade ore being sorted over and worked in a simple method which must have been very wasteful. A number of clay retorts were filled with ore and placed in a furnace. These retorts were connected by pipes with the outside of the furnace, the fumes being conveyed through a condensation pipe into aludels or clay vessels of peculiar mold which were kept half full of water. As soon as the heat was sufficiently raised the fumes commenced to pass from the furnace into the condenser pipe—thence into the aludels, where it is condensed into metallic mercury. This method was very wasteful. It gave way later to an improved method by which more ore was worked. The ores were roasted in a furnace shaft, coarse low-grade ores being first placed on the arch, which was perforated to admit the heat from the fire below; above this was placed the rich ore. The entrance was closed with tiles and the mass heated up. The mercurial vapors as they ascended were collected in a chamber, thence led out onto a sloping roof having twelve rows of aludels containing forty-four in each row; there being twenty-two sloping downward, and beyond that twenty-two sloping gently upward. The bottom of the aludels were perforated, permitting the mercury to escape and gather in a trough at the hollow between the rows. The aludel, it may be of interest to explain, is an Arabic term for a pearl-shaped vessel made of clay, having a large aperture at one end into which the small aperture of another aludel can be inserted, the idea being to obtain surface in enclosed spaces in which metallic mercury could be condensed from the vapors. The vapors that passed through the aludels were conducted into a tower and through water in the bottom of it, being finally allowed to escape into the air; this method was known as the Bustamente process or furnace. In comparing the processes of reduction, we find that in later years improvements have been made in the Californian mines which have been adopted in Europe and vice versa.

The improvement on the Bustamente furnace was the intermittent furnace, the capacity of which was gradually increased up to 100 tons; as, however, the process of distillation, charging, heating and cooling off the furnace occupied an entire week, and sometimes longer, this method gave way to the continuous process now usually adopted.

It must be borne in mind that in earlier days the entire product of the mines was not reduced, nor is it so to-day. The ores are carefully sorted—the rich ores in the mine, the balance in the sorting sheds. The ores are usually passed over screens of 1 inch; what passes through is in California termed "tierras," and at New Almaden carries from 1% to 3% mercury; in Spain it is called "vaciscos." The larger ores are closely sorted and in California about five-sixths rejected. This is again sorted and the larger and richer ores culled and called "granza," carrying 6% to 8% mercury; in Spain it is called "metal," carrying over 15%. This is again screened and the smaller particles called "granzita" in California and "requiebro" in Spain. Taken out in California these carry 1% to 3%, in Spain 7.15%.

The poorest grades of refuse are in California called "terrero," and in Spain "china." The fine ores in California used to be mixed with clay and formed into "adobes," which were sunbaked and then roasted. A charge for an intermittent furnace of 100 tons capacity was about as follows: 73 tons granza, 7% to 8% ore; 9.6 tons terrero, low-grade refuse; 6 tons tierras, tierras of about 1% to 3%. This was covered with sheets of iron and luted down. The charge required about five days to roast and three to cool. The estimated cost of reduction was about $1.36 for fuel and labor per ton of ore.

The next improvement was the continuous furnace, adopted first in the form of monitors, with a capacity of twenty-one tons per twenty-four hours.

The size of furnace was as follows: 6 feet wide, 11 feet high, terminating in a cone frustum 8 feet deep. When operated the furnace was first filled to the depth of the fireplace with spent ore, above this 3 feet of "granza" mixed with wood or charcoal. A good fire was maintained in each of the three fireplaces with which the furnace is furnished, until a cherry-red heat is obtained; some of the spent ore was then removed and a charge of ore introduced at the top of the furnace. The gases collected in the space over the ore and thus served to heat the next charge, passing off through an outlet pipe into the condenser. The cost of working this furnace per ton of ore is given as 90 cents for fuel and labor.

The next advance was the Hurtner & Scott continuous furnace, adapted to fine ores. It differs from the preceding in that each furnace is so much narrower in width, being only about 2 feet wide, 27 feet high and 12 feet long; two are built side by side. This was the first introduction of the slanting tiles, which were made 36x16x3 inches. A space of only 3 inches intervened between the projecting end of the upper tile and the face of the lower one. This furnace is reported to handle one ton of ore in forty minutes, the cost being reduced to about 64 cents per ton for fuel and labor.

About the last improvement to be referred to is the continuous furnace in use to-day which does away with a separate furnace for the fines, all the ores being roasted together in a continuous furnace.

Ore bin; ore drying over first condenser; feeding floor; furnace 22 feet long, 16 feet wide, 37 feet high, securely braced and bound, built of brick, underneath supported on iron plates adapted to save mercury which may work through the bottom of the furnace; furnace has four compartments, divided in three sections.

There are twenty-four shelves in each of the four compartments, 6 inches intervening space between tiles, ore automatically discharged every fifteen minutes, introduced every hour, tailings washed away with surplus waters from the condensers; the ore in its passage through the furnace occupies twenty hours; capacity fifty tons; amount of fuel required, two and one-half cords of wood.

Draft, running into vapor chamber, thence through big pipe 30 feet long into first condenser. The fumes leave the furnace at about 372° C., enter first condenser at 191°, third 37.8°, leaving the sixth or last condenser at 13.9°, and enter chimney at 13.3°, only about 0.5° above external temperature.

Some of the heats in the furnace chamber are worthy of note: Combustion chamber, 800° to 900°; first tier, 700° to 800°; second, 500° to 600°; third, 500°; fourth, 360° to 400°; outlet, 260° to 360°. In Europe four sections are used instead of three.

There goes over to the first condenser, besides the fumes, first, fine particles of ore and ash, soot; second, condensable—mercury, water, sulphates, mercurial salts, sulphuric acid; third, gases absorbed by water, sulphuric acid, ammonia, hydrocarbons.

In Europe the fumes are passed through iron pipes first; these are lined with cement to prevent the acids from attacking the iron; water is kept constantly flowing over them; two sets are used, the pipes being elliptical in shape. One set is in use, while the other is being cleaned out; 90% is recovered in the first chamber using this process.

In California, the fumes are conducted to the condenser, which is a large chamber divided, as shown, into three chambers, subdivided by thin board partitions to give greater cooling space. The greater part of the recovery takes place in the eighth compartment of the first condenser, gradually decreasing and producing almost nothing in the last two or three condensers.

Considerable care has to be exercised in the working of the low-grade ores, for various reasons, chief among them being, that in low-grade ores the amount of mercurial vapors is very small, and on account of the large amount of gases from the hydrocarbons, it is difficult to collect the fine particles of the metal. There is carried over, moreover, with the vapors and deposited in the condensing chambers, a material called "stupp," which is of black, sooty appearance, containing a considerable amount of metallic mercury very finely disseminated through the mass and some oxide. Only about 30% of the quicksilver is recovered in the condensers, the rest

* Read before the Los Angeles, Cal., Academy of Sciences, Geological Section.

being held in the "stupp." This is removed, mixed with lime and ground; from this treatment about 90% is recovered, the balance of 10% being transferred hack to the furnace and roasted again.

Efforts have heen made to concentrate low-grade ore, hut the cost of milling and concentrating generally exceeds hy a considerable amount the cost of simple roasting, and hesides the difficulty encountered in saving the fine particles of cinnabar, which has a great tendency to slime, causes a heavy loss in the process. In Italy, where the attempt was made for several years, the tailings, averaging over 1%, are now being roasted at a good profit, but much loss occurred hy reason of washing away of quantities of tailings.

CALIFORNIA.—The California mines are mineralizations along faults occurring hetween the metamorphic and unaltered formations.

The sandstone and shales are the unaltered formations, and the serpentine the metamorphic. Where there is a clay gouge the ores are confined to the vein, the clay forming an impenetratahle barrier. This clay, frequently called "black alta" hy the miners, a Spanish term applied from its frequent occurrence on the hanging wall, is taken as a good sign and is usually followed in the quest for ore.

Where, however, the mineralization has not heen confined, the cinnahar has impregnated the sandstone and sometimes has left the vein barren; this has proven misleading and sometimes unfortunate, for without proper developments to ascertain the extent of the ore body, plants have heen erected which could not he kept running.

In tracing the course of the helt it is not unusual to find that the sandstones are on one side of the vein, and within a few miles they will he encountered in the other.

The New Almaden mine is the deepest quicksilver mine in California, having heen worked to a depth of over 2500 feet. Like all other mines in the early days, it was gouged for its rich ores, the ores reduced in early times heing estimated to carry 36%. It has 70 miles of workings, and since 1845 has produced nearly 1,000,000 flasks of quicksilver. On the 600-foot level a large hody of ore was opened up 45 feet wide, 16 feet thick, which was followed 650 feet; this was overlayed with "alta;" penetrating this another hody of ore was discovered overlaying it, of unknown extent and value. There are eight furnaces to treat the ores. The mine has produced over $45,000,000 worth of quicksilver.

The Sulphur Banks is well worthy of mention, as the property has recently heen acquired with others hy a New York syndicate.

Quicksilver is heing deposited to-day at these mines, which were first worked for their sulphur. Penetrating helow the surface, cinnahar was encountered, which proved richer as depth was gained. The workings are extensive, and up to 1890 this was the second largest producer. Most of the values were extracted from the open-cut work. Very heavy timhering has heen necessitated; springs of hot mineral solutions are encountered in the mine, which make work difficult, especially in the stopes.

The Napa Con. (Oat Hill) has three veins with a large amount of development work; the capacity of the plant is fifty tons.

Many of the old mines, owing to the active demand for the metal, are heing reopened; amongst others worthy of mention are the Oceanic and Klau mines, in San Luis Obispo county, both old producers. The Pine Mountain Co., also in the same county, has successfully opened up large hodies of ore.

There are eight producing counties in California. The order of their production is as follows:

County.	Mines.	Production.
Napa	Ætna, Oat Hill, Manhattan, Redington, Vallejo	8,724
Santa Clara	New Almaden, Guadaloupe	5,145
San Benito	New Idria	3,990
Lake	Sulphur Banks, Abbott, Bullion, Mirabel, Great Western	3,165
Trinity	Altoona	2,294
Sonoma	Great Eastern, Sonoma, Cinnabar King	2,209
San Luis Obispo	Pine Mountain, Oceanic, Karl Klau, Mahoney	515
Colusa		275
Total		26,317

In the face of a steady advance in prices, the production of the California mines, with one exception, during the past five years has steadily decreased. This has not been confined to California, as shown hy the following statistics:

	Austria.	Italy.	Mexico.	Russia.	Spain.	U. S.	Total.
1895, tons....	535	199	213	434	1506	1179	4069
1900, tons....	550	220	335	340	1111	967	3523

The present price of $48.50 per flask should materially advance, when the fact is taken into consideration that the South African and Chinese markets are hardly yet reopened. The following countries annually import quicksilver extensively:

England	$2,000,000
Japan	156,000
India	120,000
China	100,000
Russia	10,000

USES OF MERCURY.—On account of its affinity for metals, especially gold and silver, mercury is used to amalgamate these metals, when disassociated from their gangue, in the mills. We can realize somewhat the value of mercury if we will stop for a moment and think how would the amount of gold and silver now in use have been recovered without its aid.

This use consumes a large amount of the yearly production, there heing a considerable loss in the milling process, hy loss in tailings, flouring, and recovery from the hullion. But, besides this, mercury has had from the earliest times its uses in the arts, being known in medicine and used for many cures. Recently a large amount has heen requisitioned in the new electrolytical process for preparing chlorine and caustic soda. There is but little loss in the operation, however, and a works once well supplied requires but little more.

To produce one ton of caustic soda weekly one ton of quicksilver is required, it heing used as a bath and selected hecause not affected hy the gases generated in the process.

Probahly one of the largest uses to which it is put, outside of milling, is the manufacture of vermilion paint, which is carried on chiefly in China and England. The processes in all countries where the manufacture is carried on are supposed to be secret. It is somewhat remarkahle that with the production of California our quicksilver should be exported to England and China to he imported as paint. After studying some of the methods employed in manufacture, I find there is considerahle difference in proportions of sulphur and mercury and foreign elements introduced. For instance, in Holland, seven pounds of mercury to one pound of sulphur; in China, two pounds of mercury to one pound of sulphur; in Austria, five pounds of mercury to one pound of sulphur.

The proportions used in England I am unable to ohtain. The method of manufacture is as follows: The charge according to methods in Holland is first well mixed and moderately heated, producing a hlack compound called hlack "æthiops." This is introduced into long subliming pots in charges of twenty-five pounds four times an hour; as the charge is added it ignites and when flames have subsided the pot is covered with an iron plate and further heated. The process occupies thirty-six hours. The vermilion is taken out and ground, elutriated and dried.

The same process is followed in China on a more crude method, but the Chinese product is valued for its rich carmine properties. In the second part of the process the charge is introduced into a fixed iron pan, which is covered with hroken tiles and then covered with a pan 4 inches smaller. The space is luted between and four holes left, a hrisk heat is applied and kept up for eighteen hours. When cool the vermilion is taken out and ground. Alum and glue are added to the mixture to facilitate the precipitation of the vermilion in various grades—the poorest is worked over again.

A wet method is also employed which enables the manufacturers to produce a very fine quality. A description would employ too much time and technicality.

The paint of commerce is much adulterated with red lead, chrome red, and frequently gypsum. They are easily detected.

Another production is fulminate of mercury, an explosive of great force. This is made by mixing one part of mercury with ten parts of nitric acid. Alcohol is added, and a white precipitate formed.

Care has to be exercised in the process as the gases evolved are very poisonous. The explosive force exercised is greater than that of gunpowder, and is too sudden for use in guns.

Mixed in larger proportions with saltpetre and sulphur and water it is ground and used for percussion caps, heing coated with varnish to protect it from dampness. Two pounds of mercury converted into fulminate is sufficient for the preparation of 57,000 caps used hy sportsmen.

Further uses of mercury are found in medicine, and in the manufacture of mirrors, harometers, thermometers, lahoratory and mechanical instruments.

DELEGATE SMITH of Arizona has offered a bill in Congress which provides that all of the mineral lands on Indian reservations in Arizona shall he open to entry, location, development and operation hy citizens of the United States, subject to the laws now in force with reference to other puhlic lands. It is provided that, in addition to the requirements of the general law, all parties locating and operating such claims on mineral lands shall pay to the Secretary of the Interior 5% of the net profits derived from such mineral claim. Such payments are to be used as a trust fuud for the henefit of the Indians upon whose lands the claims are located.

THE total exports of silver from British ports and from San Francisco to the Far East for the ten months ending Octoher 31, 1901, are $44,085,766, as compared with $52,483,723 in the same period in 1900. Japan has ceased, or nearly so, importing silver. The chief change has heen in the heavy decrease—47.7%— in the sales to China. At the average prices of the year the shipments to the East for the ten months of the current year have taken approximately 74,000,000 ounces of fine silver.

The Chemical Analysis of Portland Cement.

BY RICHARD K. MEADE.

A common error prevalent among engineers and cement users in general is the belief that a chemical analysis of Portland cement is of little value to any save its manufacturer. They hase their opinions upon the fact that a mixture of quicklime and clay might have the same analysis as Portland cement, and yet the mixture would have no hydraulic properties. It is true that chemical analysis taken alone gives no certain indication of the quality of cement, yet, on the other hand, if made in connection with some of the simplest physical tests it hecomes a most reliahle aid to the engineer in forming an opinion.

The chemical composition of Portland cement is very regular, and the limits of variation in the percentage of any element are very narrow. In a table recently made out hy the author, containing over 100 analyses of many American and German cements, the limits of variation were as follows:

Silica	20.95 to 23.48
Alumina	5.51 to 9.74
Ferric oxide	2.28 to 4.95
Lime	58.93 to 65.59

Chemical analysis alone will not show the character of cement, because the hydraulic properties depend upon the thoroughness with which these elements have heen comhined hy mixing and hurning. If, however, in a cement these elements are incorrectly proportioned, no amount of hurning can make a first-class cement.

Manufacturers and cement chemists now agree fairly well that the hydraulic properties of cement are due to certain definite compounds. While the proportion of one compound to the others is variahle, the percentages of each element which go to make up a specific compound are fixed. From this it follows that if we know the percentage of any given element in a cement we can calculate the quantity of the other elements which must he united with it to form a definite compound.

Newberry, Le Chatelier and others now agree that hydraulic properties of cement are due to the presence in it of a certain aluminate, ferrite and silicate of lime. Newherry and Le Chatelier hoth give the formula $3CaO.SiO_2$ to the most important of these compounds, silicate of lime. Taking this formula as correct, it will he seen that for every 60 parts hy weight of silica present in the compound there must he 168 parts of lime, or for 1 part silica 2.8 parts lime. The aluminate of lime has the formula $2CaO.Al_2O_3$ according to Newherry and $3CaO.Al_2O_3$ according to Le Chatelier. The first of these formulas is more probahly correct, as it agrees closely with the hest practice. Taking this as the formula for the aluminate of lime, it will he seen that for every 102 parts by weight of alumina there must be present in the compound 112 parts of lime, or for 1 part alumina 1.1 part lime. From this Newherry deduced the following "Hydraulic Index" or ratio hetween the acid and basic elements of cement:

$$\text{Per cent lime} = \text{per cent silica} \times 2.8 + \text{per cent alumina} \times 1.1.$$

The composition of most well-known Portland cements is very similar to the ratio shown hy this formula. That they do not agree exactly is due to the fact that this formula represents the maximum percentage of lime admissible for any given percentage of silica and alumina. Why the maximum is never reached safely will he shown presently.

It will he seen that while the ahove formula fixes the percentage of lime for any cement the percentages of alumina and silica may vary. Practice, however, and the recognized properties of the compounds themselves regulate the proportions of the two, for the silicate of lime gives the hardening powers to cement, while the rate of setting is controlled hy the aluminate of lime. Portland cement usually contains from 5% to 10% alumina and oxide combined. Iron oxide counts as alumina, since its properties are similar. As the percentage of alumina rises in cement, other factors being equal, it becomes more and more quick setting.

The maximum percentage of lime as shown by Newherry's formula is seldom attempted hy any cement maker because of the danger of an excess of free lime in the cement. In order to get the silica, alumina and lime to combine it is necessary to grind and mix the raw materials very thoroughly and burn until the lime is all combined. If the grinding is not fine enough, the mixing not intimate enough, and the burning insufficient, some of the lime will remain frce or uncombined and cause the cement to crack and expand in hardening.

The compounds contained in cement may he classed under three heads:

1. Compounds with hydraulic properties, such as the silicate and aluminate of lime.

2. Compounds deleterious to Portland cement, such as magnesia, calcium sulphite, calcium sulphate, free lime, etc.

3. Inert compounds, such as uncomhined clay, sand, calcium carbonate, etc.

Chemical analysis will show per se if such deleterious compounds as magnesia, calcium sulphite, cal-

cium sulphate are present in quantities sufficient to injure the cement. The analysis will also show us if the cement is of normal composition. Even if the magnesia, etc., are under the limit, cement with abnormal proportions of the chief constituents, unless wanted for some special purpose, is to be looked upon with disfavor.

Calculation from the chemical analysis, using Newberry's formula, will readily show if the maximum of lime has been exceeded, or if the percentage of lime is far under this. The analysis can be made to show the percentage of uncombined clay or silica, and the calcium carbonate can, of course, be determined.

The Cost of Mine Patents.

Written for the MINING AND SCIENTIFIC PRESS by THEO. F. VAN WAGENEN, E. M.

By the average miner the patenting of his claim is regarded as a matter of so great expense that he generally prefers year after year to perform the annual assessment, $100, upon it—even long after the $500 worth of work is done which must precede patenting—rather than apply to the Government for a perfected title. Of course, this annual assessment rarely costs him in cash more than $30 to $50 and, in a great number of instances, involves merely enough outlay to provide him with food during twenty to thirty days' of easy work; and so the burden is light. But in the case of non-resident owners, who actually pay $100 in cash to some miner to perform the work, the item is often a serious one.

It is a condition of affairs that should be changed. The mine patenting system, as it is now operated, is susceptible of great improvement by comparatively slight modifications of land office practice, and enormously valuable benefits to the mining industry would follow if certain changes were made which would encourage the miner to perfect his title within three to five years after making his location. Much of the distrust that is connected in the minds of investors with metal mining as a business, is the result of unfortunate experience with titles. They buy mines which prove by development to be valuable, and then, sometimes on account of the carelessness of the locator in defining his boundary lines on the ground, or in the location certificate, or through the knavishness of others who make it a business to take advantage of such defects, find that either they do not own the ground they have bought or will be compelled to expend vast sums in court to protect their purchase.

Of course, every one engaged in mining in the West has his opinion about the national mining law. Many are in favor of altering it so as to exclude extra-lateral rights. Others would have square locations. Some have suggested Government control of the act of location. But the law has now stood for so many years without material amendment or change, and has been elucidated so thoroughly by department rulings and court decisions, that it is very doubtful whether as much general benefit would result from radical fundamental changes, as through additional rulings along common sense lines, as occasion called for them. And, in my opinion, none could at the present time be more timely than those which had for their object the simplification of the process of patent application and the lessening of its cost.

Much has already been done towards that end. Thus, not many years ago, each claim under identical ownership had to be the subject of a separate application; whereas now any number of adjoining claims so owned can be put through under one set of papers; disconnected mill sites can now be applied for in connection with lodes owned by the same parties. Improvement money ($500 per claim), as well as the annual assessment money ($100 per claim), may now be expended in certain cases on one claim of a group, to the very great advantage of the owner, instead of, as formerly, being spent on each claim. Again, the miner has himself taken a hand in the simplification of the business in certain places by voluntarily abandoning—as at Leadville, Colo., for instance—all extra-lateral rights; and many wise mining operators have followed his example by making it a practice to buy up or take up adjoining territory before proceeding to development, so as to avoid all possible complications that might result from the departure of their vein in its dip beyond their side lines, or of the apex on its strike from their surface boundaries.

To sum up the situation, it may be concluded that the American mining law will not be fundamentally altered: first, because, as at present operated, it is an inherently American system and contains features which are essentially in harmony with a republican form of government, in which the individual is generally left to take care of himself, or suffer the consequences if he does not; and, second, because the Western miner has become thoroughly used to its workings, and, on the whole, likes it with all its faults. And it being shown that, through the process of court decisions and department rulings, a great deal of improvement has been already effected, the disposition is to allow the process to go ahead naturally as experience points out the way.

It is along these lines, therefore, that I venture to make some suggestions. And, as the actual details of patent application are still so much of a mystery to a large number of miners and mining operators that they consider it necessary in nearly all cases to employ an attorney to attend to the business for them; and as there is an astonishing ignorance among many attorneys, even in the West, of the vital features of a mining application, I shall explain the process with some detail, in the belief that by doing so the way will become clear for a demand among mining men for such additional department rulings as will accomplish the ends desired and thereby encourage the perfecting of mining titles. That such a result would greatly stimulate and improve the mining industry there can be no doubt. Vast amounts of capital are ready for investment in mines, if titles of assured strength can be had; and thousands of individual miners would gladly patent their claims if they could do so at moderate cost, or upon the installment plan, which is at the command of the farmer who wishes to own land. Thus, much money would come to the West, and much new ground would be open for taxation.

The first prerequisite to a patent on a mining claim, either lode or placer, is a proper location certificate on record at the recorder's office of the county in which it is situated. This must give the name of the claim, the name or names of its locators, the date of its location, the length and width in feet of the ground claimed, the direction or course of its center line, and such a description of its situation and corners as will permit a man of average intelligence to find it if he really wants to. A discovery shaft, or cut, or opening, exposing the vein or deposit to sight to the depth of at least 10 feet, must be dug, if it is a lode claim, or an excavation deep enough to prove the mineral character of the material, if it be a placer. A stake or monument of some kind must be erected by the side of this excavation, and a written notice, setting forth all the foregoing facts, must be posted on the stake, or placed upon or within the monument. The certificate must then be recorded. These are the essential features of the United States mining law. In addition, there have been enacted during recent years in every mining State and Territory in the West additional State regulations, prescribing the maximum size of the claim, the method of marking its boundaries, and the extreme period allowed after the act of location for recording. Miners can always obtain printed copies of these laws by corresponding with the Secretary of State of the State in which they are operating.

Of course, the miner is rarely a surveyor, or knows how to use an instrument. Consequently, he paces off his ground or measures it with a tape as best he can. As a result, nearly all original locations are of irregular shape and contain a larger area than the law permits. And as the land office regulations state that the patent application must conform to the courses and corners of the location certificate, it becomes necessary for the miner who initiates patent proceedings, in nearly all cases, to place on record an amended location certificate, giving a description of the courses and distances of his boundary lines accurately, and tying the location correctly to the nearest Government corner or mineral monument. Here comes in his first serious outlay. He applies to the nearest deputy mineral surveyor, who will charge him from $10 to $50 for the job, according to the comparative accessibility of the claim and the difficulties connected with the work. When that official has finished, if he has done his work as correctly as he should, and as he could without giving any extra time and expense to the job, he has really made a patent survey, of which the miner should have the benefit. But he rarely does; for, according to the regulations of the Surveyor General's office, no deputy can make a patent survey until he receives an official order to that effect; and before an order will be issued a correct location certificate must be placed on record and a certified copy thereof sent to the Surveyor General.

So, in effect, the miner is between the devil and the deep sea, and must pay twice for the survey of his claim; for when the survey for amended location is correctly and carefully made, the deputy, when he makes the patent survey, merely goes over the lines perfunctorily and marks the corners, and there is nothing more for him to do but to write up his field notes in prescribed form and make the plat; but he always makes an additional charge for this second survey.

Here, then, is the first chance to lessen the cost of a patent to the miner. Without legislative enactment, deputy surveyors can be instructed, first, to be as thorough in the making of an amended location survey as they now are in one for a patent; and, second, to file at once with the Surveyor General a copy of the plat, description and field notes; and the Surveyors General in each State can be authorized by the General Land Office to use these documents without further additions for the patent application when it is desired, if the applicant so wishes. By such rulings, miners would be relieved of from $50 to $100 in the expense of surveying their ground.

The second prerequisite to a patent application is that $500 worth of work shall be performed on the ground or for its benefit. The requirement is a severe one, far more so than any the agriculturist is called upon to hear, who can also buy his land from the Government at from one-half to one-quarter the price the miner is compelled to pay. Yet it is a question whether the amount can be wisely reduced. But miners should be given to understand more clearly that they have till the end of the advertising period in which to complete this expenditure, and the proof of it should not be called for among the preliminary papers as is now the general practice. Moreover, it might be a wise plan to permit the cost of the patent survey to apply on this sum, or to give the applicant an additional year or two after advertising in which to finish it.

The patent survey being made, the applicant is next under the necessity of filing in the land office of his district a set of papers of a very complicated nature, the preparation of which is almost always delegated to an attorney; who rarely charges less than $100 for his services, and from that up to $500, or even more in some of the sparsely settled parts of the West where there is no competition among the lawyers. Now, when it is understood that these papers from first to last can all be drawn up by any man of average clerical ability and experience in that class of work, and who has a good typewriter at his command, in one office working day; that blank forms of all of them are to be had at the stationers; and that the busy lawyers always turn over such work to their stenographers, giving them blank forms to follow and rarely doing more than to glance over the documents after they are completed, it becomes evident that the miner is very effectually milked at this stage of his progress towards patent. In addition, it is a very rare circumstance for a set of patent papers to go through the office of even the best lawyer in the West without error, while those that issue from the studios of a majority of young and inexperienced attorneys are veritable marvels of blunders. And the reason is plain. Not one attorney in a thousand is competent through education or experience to draw such papers. The bulk of them consist of land descriptions expressed in terms of the engineer, in which courses and distances; degrees, minutes and seconds; sections, townships and ranges; bearings, distances and variations follow each other with a persistence and continuity inexplicable to any one who has not had the training of that profession. And all such papers should be drawn by an engineer and not by a lawyer. In the early days of the mining industry in the United States they always were. It was the part of the Deputy U. S. Mineral Surveyor to make them out. And in their hands the burden on the miner was much less than it is now.

This list of patent papers under ordinary circumstances are about eighteen in number, and may be naturally divided into four classes, as follows:

1. Those which consist wholly or mainly of descriptions of land, viz., notice for posting in land office, notice for posting on claim, notice for publication, application, proof of posting on claim, proof that notice remained posted on claim during advertisement, proof that notice remained posted in land office, proof of no vein in placer or mill site.

2. Those which have to do with the advertisement of the notice of application in the newspaper published nearest to the claim, viz., contract with publisher, proof of publication.

3. Those which have to do with the chain of title of the claim, viz., certified copy of location certificate, proof of non-abandonment, abstract of title, proof of citizenship, articles of incorporation (where applicant is a corporation), power of attorney (where applicant is a non-resident of the district).

4. The so-called final papers, viz., proof of sums paid, application to purchase.

Under the existing system of practice all of these are now either drawn by the attorney or ordered by him from the office of the recorder of the county in which the claim lies. And for this service, to which should be added the transmittal of the papers to the land office, the miner has to pay, as stated, from $100 to $500. But observe how easily (and properly, too,) the whole matter could be attended to otherwise, by the aid of a few department rulings:

Class 1.—These papers could all be drawn in the office of the Surveyor General of the State in which the claim lies, and provided for the claimant, with the field notes and plats, which now come from that source, free of all cost. They are really nothing but extensions of the former, and can only be correctly prepared by officials and employes who are daily and hourly engaged in using the language and phraseology of the civil engineer; and they can do the work in a quarter of the time it would take most any one else. Besides, the fees charged at the present by that department of the Interior Department are out of all proportion to the work it now does for the miner. A surplus of several hundred thousand dollars is accumulating per year from these fees, and a bill is now before Congress to permit of its repayment to mineral applicants of the past—an utterly impossible proposition. But for the future these fees should be either heavily reduced or more given to the miner for them; and it is highly probable that both could be done without involving the Government in any expense. The precious metal miner of the nation has a naturally strong claim on Congress for consideration, yet his is the one occupation of the country that has yielded a cash profit to the Government in the management of its affairs. Many millions have been made by the Government in the operation of

the coinage laws, and already several millions through the regulations in force in the department of mineral land surveys.

Class 2.—The publisher who is awarded the contract for printing the "Notice of Application," for which he is legally entitled to charge at the rate of $5 per inch of column occupied, can be properly instructed by the General Land Office to provide these papers, and no doubt would most willingly comply without any extra charge, for the cost to him would be practically nothing.

Class 3.—All of these papers are obtainable at the offices of county recorders at reasonable prices, except the "Proof of Non-Abandonment" and "Proof of Citizenship." Their books will show the facts in each case, and, if the Government provided the blanks, they would be only too willing to add the business of furnishing certificates at a moderate charge.

Class 4.—These two papers can most appropriately be furnished by the local land office free of all expense to the applicant, including their verification.

All these modifications in practice can be accomplished without Congressional action, therefore they could be brought into action quickly, which is a very important point. Let us now consider what might fairly be expected in the way of results.

There would surely be a rush on the part of mine owners for amended certificate surveys. Many would find themselves able to spare the $25 to $50 for this work, especially if it were applicable on annual assessment account. Moreover, as it would be the first installment of the patent proceedings, many would strain a point to take it, knowing that a further step need not be taken until it was financially convenient. As matters are now arranged, many a miner hesitates to begin application, for after once initiating proceedings he cannot stop without very inconvenient and often serious consequences to his title. It needs no argument to prove that the general mining public, and the prospecting class in particular, would be greatly advantaged by the definite delimitation of claims. Much of the mining litigation now in progress, or that has occurred in the past, has been directly due to the uncertainty which always exists as to the boundaries of unpatented ground.

The survey being the only varying item in the process of mine patenting (if attorneys' fees be excluded), the claimant who had secured his amended certificate could at once calculate accurately what expenses remained to be provided for, and the thrifty ones would be greatly encouraged to push the proceedings to a finish. At the same time those not so provident would be in a much better position to sell.

The cost of patenting a single claim under present conditions, will average about $400. With the modifications in practice which are herein suggested, the expenses would rarely equal $250. In groups of claims the economy effected would be even greater.

Many will believe, however, that the miner will always need the assistance of some professional in patenting his claim, no matter how simple the process is made; and it is likely to be the case. He will be too busy with his own work to give it even the little clerical attention that it would demand. The question then arises, "Would he still have to call upon the attorney for help, or could the Deputy Surveyor act as his professional friend?"

I believe that a thorough consideration of the subject by those most competent to decide will lead to the conclusion that the task of guiding the miner along the road to a patent is more within the province of a surveyor than of an attorney. The former is very often a practical miner himself, and being much of his time on the hills is brought more in touch with the business. He generally understands its phraseology, and always knows how to properly get around the many little foolish requirements in patent application matters which are perhaps the unavoidable result of laws and regulations enacted by men who don't know the difference between a mineral vein and a plank road. The attorney on the other hand, is generally not only a stranger to the miner, but is rarely posted as to matters of the hill and the open, being essentially a city and an office man, who is usually clothed in purple and fine linen and expects to be well paid for keeping himself in so immaculate a condition. If at times he dons the yellow boots and suit of the deputy, his outfit is certain to lack the familiar decorations of candle grease, mine clay and yesterday's dinner, and every one knows it is a hollow pretence for which some one will have to pay when the hill comes in. Of course there are lawyers and lawyers, and many of them are as full of essential manliness and the milk of human kindness as any class of men; but it seems to be the general opinion among the plain people that when Gabriel blows his horn and seats are being assigned at the marriage feast, the legal fraternity as a body will be located some considerable distance from the head of the table. And no doubt there will be some Deputy United States Mineral Surveyors in the same vicinity.

Fifty dollars is a high average cost at the present time for a single claim patent survey. If deputies could be assured of even something less than that amount (net) on each claim surveyed by them, they could easily afford without extra charge to guide the claimant through the details of the process of patenting, attend to the ordering, verification and transmission of all his papers, and make his entry. It is work for which they are naturally better fitted than anyone else, and in my opinion it should never have been taken away from them. As a class they are men who command high respect among mining operators, and, being under heavy bonds, have every incentive to accuracy and faithfulness.

Construction of Mine Telephone Lines.

In the Electrical Review A. E. Dobbs gives some practical suggestions relating to telephone exchange construction which are applicable to the conditions met with in the construction of many telephone lines for mines. In this work for mines the necessity for economy in installation is always urgent. The setting up of a regular pole line is frequently prohibited by cost alone, and recourse must be had to trees as a substitute for poles. The use of these has been found to be subject to some disadvantages and difficulties that pole construction avoids. These difficulties are readily overcome by simple expedients which Mr. Dobbs describes. He says that a tree which forms a convenient support for the wire can have the latter best attached to it by nailing a porcelain knob to the side of the tree, as in Fig. 1,

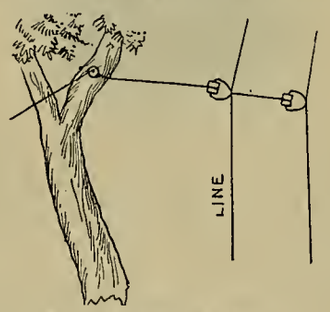


Fig. 1.—Porcelain Knob on Tree.

or a bracket, as in Fig. 2. In order to keep the wires clear of the tree they should be placed on one

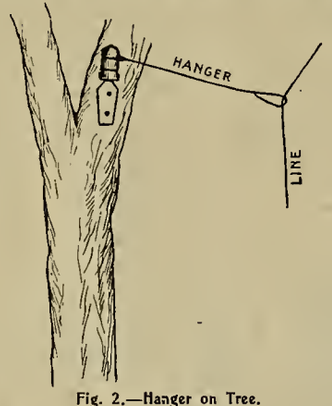


Fig. 2.—Hanger on Tree.

that will pull off at an angle from the rest of the line. For this purpose two trees diagonally from each other are sometimes selected and a long wire attached as a hanger, 10 feet or more in length, which, when the wire is pulled up, allows it to swing free of limbs or foliage. A line can sometimes be zigzagged in this manner for half a mile or more.

In addition to the knob on the tree (Fig. 1) there is also another knob or circuit breaker to each wire, to which the wire loops are attached, thus making two knobs between the line wire and the tree trunk.

Sometimes the wire is passed through the hole in the knob, and sometimes it is tied to the groove and the hanger wire passed through the hole and looped back on itself. Whatever method is used, the wire should be left free to swing with the motion of the tree, and for this reason should not be tied unless the hanger is a very long one and there is no danger of its breaking.

In Fig. 2 the knobs are dispensed with and a single wire with a loop end attached to a bracket on the side of the tree. This is better than the use of porcelain knobs, for the insulation of the wire is in this way maintained in wet weather, whereas the water runs from the outside of the knob and directly to the tree trunk, and the insulation of the line thus becomes no higher than that of the film of rainwater running down the outside. With the glass insulator the place underneath the skirt is nearly always dry and its superiority as an insulator is due solely to this fact.

Fig. 3 shows a method of suspending several wires

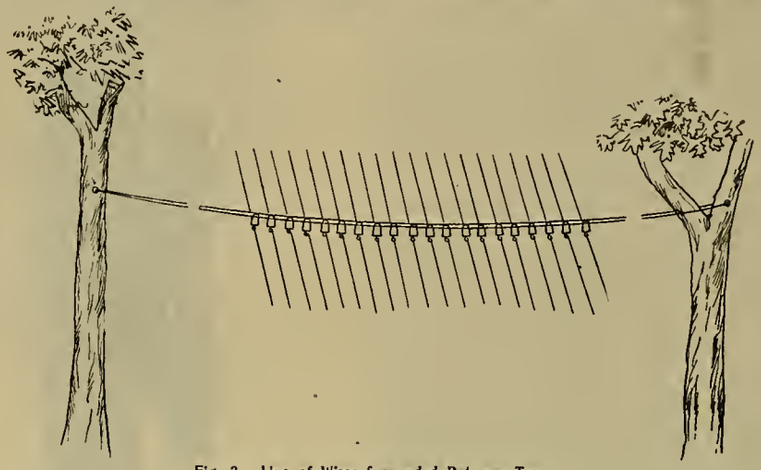


Fig. 3.—Line of Wires Suspended Between Trees.

between trees. The insulators in this case are tied between two No. 9 wires that are pulled from tree to tree, two tie wires passing around the top groove, as shown in Fig. 4.

Fig. 4.—The Wires.

The hooks shown in the bottom of the insulators may be ordinary screw eyes cemented into the glass. The wires may be left suspended loosely in the hooks without tying, provided the screw hooks or screw eyes are so arranged that the wire can not easily fall out. Sometimes porcelain knobs have been suspended on a single No. 6 wire and the line wires drawn through the center holes. This is not as good as the petticoat insulator, however. The insulators should be spaced about 12 inches apart. Access to them can be had by means of a long ladder resting against the span wires. They should be so suspended that the center of the span will not be less than 18 feet above the ground.

An objection to be urged against this form of suspension lies in the fact that if the lines should become crossed one can only reach them by means of a long ladder or a pike pole; but, as there is no reason why these lines should not be pulled taut and even, there should be no more trouble in them than in a straight-away pole line. This sort of a line is not recommended for general use, but is suggested as an expedient where there are few lines and where trees make a pole line out of the question.

C. P. Tonoray and G. E. Boren have arranged with New York people to make the installation of an electric steel plant at Elizabethtown, Tenn. It is claimed that by this method steel ingots can be produced directly from iron ore in thirty minutes. An 8000 H. P. electric plant will be commenced as soon as a site can be decided upon on the Wautauga river, near Elizabethtown.

Prof. J. F. Kemp of Columbia University, states that samples of rock sent into the United States Survey for examination by J. C. Carter of Leavenworth, Washington, contain three-eighths of an ounce of platinum metals to the ton, and finer material from the same locality contains one-half ounce to the ton.

Senator Penrose has introduced a bill levying a duty of 25% ad valorem on all importations of manufactured silver. A preamble of the bill declares it to be the purpose of the measure to protect the silver mining industry of the United States.

To Establish the Department of Mines and Mining.

In the House of Representatives Mr. Woods of the 2nd California District has introduced the following bill; which was referred to the Committee on Mines and Mining:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that there shall be at the seat of government an Executive Department to he known as the Department of Mines and Mining, and a Secretary of Mines and Mining at the head thereof, who shall he appointed by the President, by and with the advice and consent of the Senate, who shall have a seat in the Cahinet and who shall receive a salary of eight thousand dollars per annum; and section one hundred and fifty-eight of the Revised Statutes is hereby amended to include such Department, and the provisions of title four of the Revised Statutes, including all amendments thereto, are hereby made applicable to the said Department.

SEC. 2. That there shall he in said Department an Assistant Secretary of Mines and Mining, to he appointed hy the President, by and with the advice and consent of the Senate, who shall receive a salary of four thousand dollars per annum. He shall perform such duties as shall he prescribed by the Secretary and required hy law. There shall also be appointed by said Secretary one chief clerk, who shall receive a salary of one thousand eight hundred dollars per annum, and such other clerical assistance as may from time to time he authorized hy Congress.

SEC. 3. That the said Department of Mines and Mining shall have general jurisdiction over all matters pertaining to mines and mining industries and the Geological Survey, and over all the matters committed to any of the hureaus, offices, departments, or hranches of the public service hy this Act transferred from other Executive Departments of the Government to the said Department of Mines and Mining as fully as the same is now possessed hy any of the said hureaus, offices, departments, or hranches of the public service from whence the same is so transferred, and that the official records and papers now on file in and relating to the husiness of any such hureau, office, department, or hranch of the puhlic service in this Act transferred to the Department of Mines and Mining, together with the furniture now in use in such hureau, office, department, or hranch of the public service shall he, and is herehy, transferred to the Department of Mines and Mining.

SEC. 4. That there shall be in the Department of Mines and Mining a hureau which shall, under the direction of the Secretary thereof, gather, compile, and puhlish information in respect to the same, and it shall he the duty of said hureau to acquire and disseminate practical and useful information concerning the mines, mineral resources, and mining industries of the United States; that the office of the Director of the Geological Survey and the Geological Survey Service and all that relates to and pertains to the same is hereby transferred from the jurisdiction of the Interior Department to the jurisdiction and supervision of the Department of Mines and Mining, to remain henceforth under the jurisdiction of the latter; and the Director of the Geological Survey is herehy made the director of said hureau.

SEC. 5. That the Secretary of Mines and Mining shall annually make a report in writing to Congress, which shall contain an account of all moneys received and expended hy him in promoting and facilitating the development of American mines, and mining industries, and such recommendations as he shall deem necessary to the further development of the same. He shall also make special investigations and reports on particular suhjects whenever required to do so hy either the President, the Senate, or the House of Representatives.

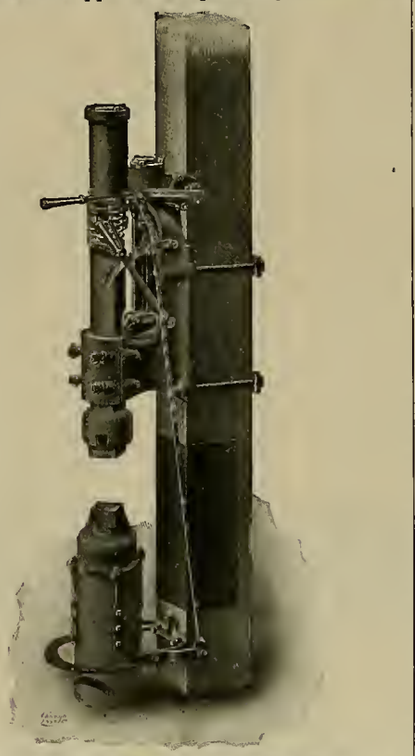
SEC. 6. That the Secretary of Mines and Mining shall have charge in the huildings or premises occupied hy or appropriated to the Department of Mines and Mining of the library, furniture, fixtures, records, and other property pertaining to it, or hereafter acquired for use in the husiness; and he shall he allowed to expend for periodicals and the purposes of the library, and for the rental of appropriate quarters for the accommodation of the Department of Mines and Mining within the District of Columbia, and for all other incidental expenses, such sums as Congress may provide from time to time: Provided, however, that where any hureau proposed to he transferred to the Department of Mines and Mining hy this Act is occupying rented huildings or premises they may still continue to do so until other suitahle quarters are provided for their use: And provided further, that all officers, clerks, and employees now employed in any of the bureaus, offices, departments, or branches of the public service in this Act transferred to the Department of Mines and Mining, are each and all hereby transferred to said Department at their present grades and salaries, except where otherwise proviued in this Act, until otherwise provided by law: And provided further, that all laws prescribing the work and defining the duties of the several hureaus, offices, departments, or branches of the public service by this Act transferred to and made a part of the Department of Mines and Mining, shall, so far as the same are not in conflict with the provisions of this Act, remain in full force and effect until otherwise provided by law.

SEC. 7. That the jurisdiction, supervision, and management and control of mines and mining lands and mining industries now vested in the Interior Department are hereby transferred to and vested in the Department of Mines and Mining.

Hundred Pound Post Hammer.

The American Engineering Works, Chicago, has recently designed a small post hammer, to he operated by steam or compressed air, adapted for all classes of general blacksmith shop work, and intended to be of especial value to mining companies for use in their smith shops. It works quickly, will turn out a large amount of work per day and is thoroughly satisfactory for all forging work 2½ inches in diameter or smaller. This hammer should be found to be a useful tool for railroad, mining, hlacksmith, and shops generally where any forging work is required.

The following cut shows the hammer attached to a post with anvil supported independently.



The action of this hammer is the same as that of a large steam hammer. The ram can be regulated to strike a hlow of the full force developed by the falling weight with the momentum due to the pressure of the steam or air hehind it, or it can be regulated so as to give the lightest possible hlow, merely touching the object on the anvil without doing any work. The cylinder is 3 inches in diameter by 10 inches stroke. It is described as heing cast in one piece, with the frame from the best quality of gray iron, the exhaust ports arranged so as to keep the cylinder always drained. The valve is under control of the operator, and is operated by a foot treadle or by hand lever. Steam valve is controlled hy a cam working on a cam path on the back of the ram, the position of the cam heing governed by the operating levers. There is also provided a safety device to limit the stroke of the piston. There is clear space of ahout 10 inches from center of die to side of post supporting the frame. The hammer is usually arranged for bolting to a wooden post 8x8 inches. Special attachments can he furnished for bolting to a heam or other form of wrought steel column, or where preferred a steel column made of extra heavy wrought pipe will be furnished, together with necessary clamps for properly clamping frame of hammer.

The ram is a solid steel forging, square in form where it passes through the lower part of the frame which acts as a guide. The lower end of the ram is arranged to receive the upper die in such position that it stands at an angle of 45° to the post supporting the hammer, thus enabling long pieces to be worked either way of the die without coming in contact with the post. The upper die is a steel casting, having a face 4x5 inches, dovetailed to the ram and fastened with wedges. The lower die is a steel casting having face 4x5 inches, dovetailed to the anvil and fastened with wedges so that it is easily removable. The anvil is designed to be secured to a 12-inch wooden block set on end, the anvil heing holted to the hlock with lag screws. The falling weight is 100 pounds. The weight of the lower die and anvil is about 150 pounds. The total shipping weight is about 575 pounds. It is furnished hy the American Engineering Works, 204 Dearborn street, Chicago, Ill.

Electrical Expressions and Their Equivalents.

Arranged for Convenient Reference by C. W. HUNT.

ONE WATT.	A rate of doing work.	
	1.	ampere per sec. at one volt.
	.7373	foot-pound per second.
	44 238	foot-pounds per minute.
	2,654.28	foot-pounds per hour.
	.5027	mile-pound per hour.
	.00134	horse power.
	$\frac{1}{746}$	horse power.
ONE KILOWATT.	A rate of doing work.	
	737.3	foot-pounds per second.
	44,238.	foot-pounds per minute.
	502.7	mile-pounds per hour.
	1.34	horse power.
ONE HORSE POWER.	A rate of doing work.	
	550.	foot-pounds per second.
	33,000.	foot-pounds per minute.
	375.	mile-pounds per hour.
	746.	watts.
	.746	kilowatt.
ONE WATT HOUR.	A quantity of work.	
	2,654.28	foot-pounds.
	.503	mile-pounds.
	1.	ampere hour × one volt.
	.00134	horse-power hour.
	$\frac{1}{746}$	horse-power hour.
ONE HORSE-POWER HOUR.	A quantity of work.	
	1,980,000.	foot-pounds.
	375.	mile-pounds.
	746.	watt-hours.
	.746	kilowatt-hour.
ONE AMPERE-HOUR.	A quantity of current.	
	One ampere flowing for one hour, irrespective of the voltage.	
	Watt-hour ÷ volts.	
TORQUE.	Force moving in a circle.	
	A force of one pound at a radius of one foot.	

The Electro-Metallurgy of Zinc.

To realize the appalling wastefulness of the present methods of zinc smelting it is only necessary to bear in mind that in the very hest practice from three-fourths to one ton of coal are consumed in producing from one and one-half to two tons of spelter from a 50% ore. Now, although, of course, the same amount of energy has to be expended in order to isolate one ton of zinc, whether it be chemically reduced or electrolytically deposited, yet the conditions under which the energy is extracted from coal and then utilized are so much more favorable in a good modern boiler, steam engine and dynamo plant than in a zinc-smelting furnace, that the advantages would he all on the side of the electrolytic process, hoth as regards cost of production and purity of product, were only that process forthcoming. But unfortunately the economy of electrolytic zinc extraction processes is not so great as would at first appear. The reason of this is to he found in the fact that in the leach, previous to electrolyis, any silica which may be present in the ore is rendered gelatinous hy the action of the acid, and it then holds a considerahle quantity of zinc solution; consequently filter presses must he used, and even then the extraction is only partial. The formation of this gelatinous silica may be overcome when treating ores which do not originally contain zinc silicate by roasting at a lower temperature, hut in this case the zinc sulphide is only partially decomposed, and consequently is not acted on by the leaching medium.

THE efficiencies of electrical apparatus are usually very good, and range somewhere near the values given in the tahle below, which is for units of 100 H. P. or over, and applies to either direct or alternating current machinery:

	Per Cent.
Generators	90 to 96
Transformers	95 to 97
Transmission line	90 to 95
Rotaries	80 to 95
Motors	85 to 95

The ahove table is a fairly conservative one for this kind of machinery. For smaller units these values are too high, and in some cases of large machines operating under very good conditions they may be too low. The efficiency of transformers and synchronous motors with good power factors is very high and represents the limit of commercial machines.

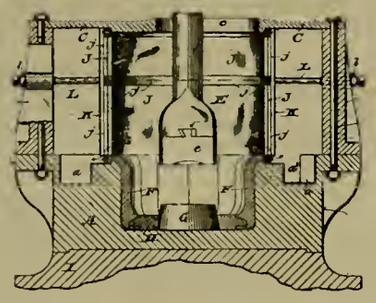
THE Secretary of State states that there is no time limit to the modus vivendi entered into by the United States with the Dominion of Canada. "During the continuance of the agreement," he says, "new claims on the Alaskan side of the provisional line are subject to the United States laws, and those on the British side to the Canadian laws, without prejudice to final adjustment of the houndary. But all rights acquired on either side hefore the modus are unimpaired. It follows that such pre-existing rights of the citizens of the one party within the provisional jurisdiction of the other may he established as of record by any reasonable formality prescribed by the authority in temporary control of the territory where such rights are claimed under the modus."

Mining and Metallurgical Patents.

Patents Issued December 24, 1901.

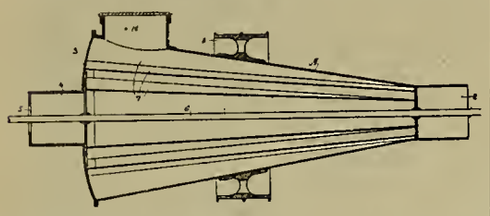
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

STAMP MILL.—No. 689,219; W. E. Parnall, Calumet, and C. H. Krause, South Lake Linden, Mich.



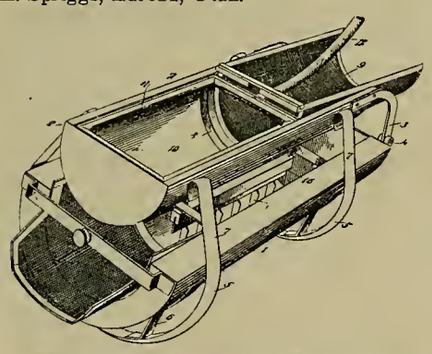
A single stamp provided with a detachable hardened shoe and a mortar having a cavity provided with a removable hardened die and hardened stave-liners constructed and arranged to receive impact of pulp and to direct same upwardly and outwardly on all sides, a removable cylindrical screen surrounding stamp concentrically therewith so as to be approximately perpendicular to direction of splash passing through it on all sides of mortar, and a removable splash-pan surrounding screen and open at bottom so as to intercept pulp passing through screen and to afford a free and constant discharge therefor.

GOLD-SAVING APPARATUS.—No. 689,612; C. G. Hambleton, East Oakland, Cal.



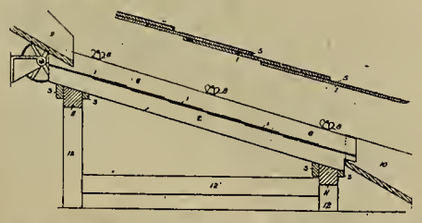
This invention consists of one or more hollow conical chambers having horizontal axes and journals at the ends with means for rotating the chambers. In the interior these chambers are provided with lifting plates or ribs, and a chamber or pocket projecting from the one side of the larger diameter receives the mercury and heavier portions at each revolution and ejects them into the surrounding mass. These depressions or pockets also serve to finally receive and retain the valuable amalgam which settles into them when they are at the lowest point, and by removing a cap the apparatus can be readily cleaned up at will.

AMALGAMATOR AND CONCENTRATOR.—No. 689,695; I. H. Spriggs, Eureka, Utah.



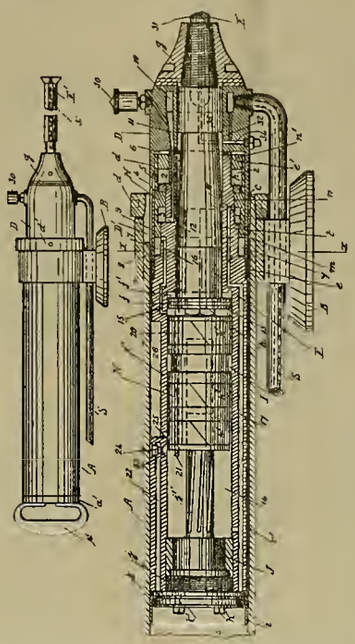
Two semi-cylindrical trays one arranged wholly over other and mounted to rock, a riffle in upper tray, a semi-cylindrical sieve extended from riffle beyond outlet end of tray and adapted to discharge material into lower tray, and a perforated water pipe extended around hopper or feed section of upper tray.

GOLD RECOVERING APPARATUS.—No. 689,733; O. M. Lawrence, Foster, Or.



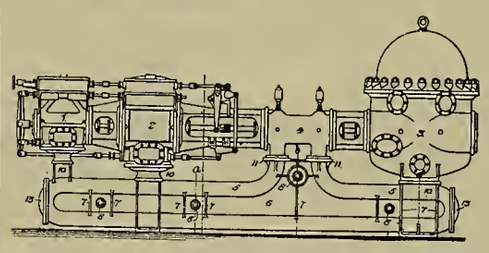
A series of perfectly flat plates adapted to overlap each other, means for holding plates in relative position to each other whereby overlapping portion is constantly same, side pieces detachably secured in place overlying edges of plates and serving to form, with plates, a trough or sluice for material under treatment, driving shafts and eccentrics connecting supports for plate with driving shafts whereby plates may be given lateral movement, upper surface of each plate being thickly coated with amalgam, whereby a layer of same is disposed between overlapping portions of each plate, lateral movement of plates not disturbing relative position of same and not interfering with layer of amalgam carried.

ROCK DRILL.—No. 689,516; F. Rattek, Bridgewater, Mass.



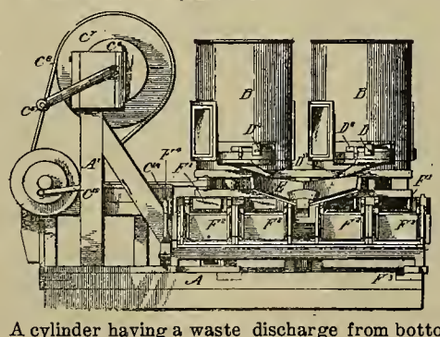
A cylinder provided with an annular valve chamber; a piston slidable in cylinder and forming chambers 13 and 14 at ends; an annular valve slidible in valve chamber and forming chamber 7 at one end which constantly communicates with atmosphere, valve being provided with pressure chamber 3 and exhaust chamber 2, and cylinder being further provided with port 16 and passage 15 which normally connect chamber 13 with chamber 7, and having also port 18 and passage 17 which connect chamber 14 with chamber 3 when chamber 13 is connected with chamber 7, valve operating when reversed to first close port 16 and then place it in communication with pressure chamber 3, and to first close port 18 and then place it in communication with exhaust chamber 2.

NON-ROTATIVE PUMPING ENGINE.—No. 689,775; L. d'Auria, Philadelphia, Pa.



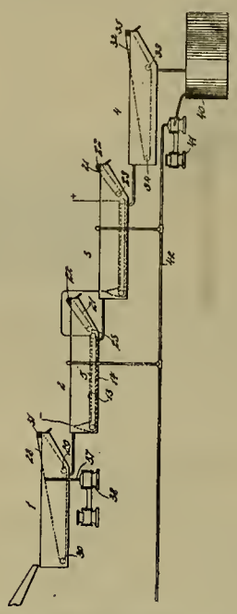
A compensator with flow pipes containing a mass of liquid, flow pipe structures being disposed side by side and constituting foundation or support for cylinder structure of engine, transverse bolts whereby flow pipe structures are connected together, and sleeves or filling pieces interposed between flow pipe structures.

CONCENTRATING AMALGAMATOR.—No. 689,805; A. M. Horton, Saratoga, Wyo.



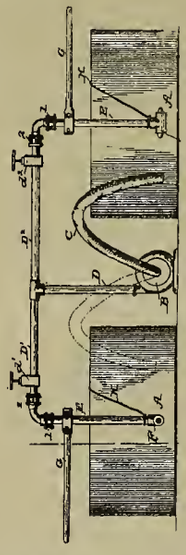
A cylinder having a waste discharge from bottom, a tank beneath cylinder, an inclined testing table communicating with tank, doors to close communicating aperture between tank and table, an independent waste discharge from tank, a pivoted lever for varying inclination of table, an ore discharge from cylinders, a settling tank, a conduit for conveying ore from discharge to settling tank, and a delivery spout at discharge end of conduit.

MACHINE FOR EXTRACTING METAL FROM ORE.—No. 689,674; A. I. Irwin, Cripple Creek, Colo.



A treatment tank, endless anode traveling in tank, upper and lower stretches of anode being in position to be immersed in solution in tank, diagonally-disposed blocks of insulating material attached to anode, cathodes in tank one under each stretch of anode, and connections with a source of electricity.

ORE LEACHING APPARATUS.—No. 689,799; R. L. Graves, Sumpter, Or.



A plurality of tanks, a pump, a discharge pipe leading from pump and having a plurality of branches leading to several tanks and provided each with a discharge pipe which may be turned axially or swung vertically, valves controlling several branches, and a flexible supply or suction pipe leading to pump and arranged to be shifted from tank to tank, levers connected with several discharge pipes whereby they may be turned axially, and means connected with lower ends of discharge pipes whereby they may be swung vertically.

PROCESS OF REDUCING NICKEL SALTS.—No. 689,391; H. A. Frasch, Hamilton, Canada.

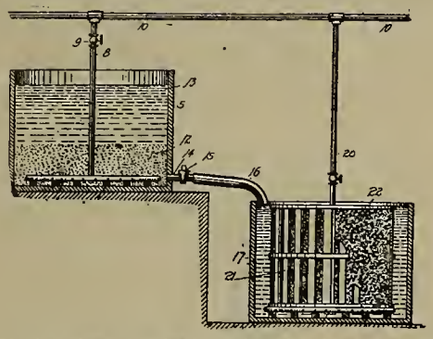
Bringing metals into solution, precipitating hydroxides by addition of a suitable reagent, dissolving hydroxides which are soluable in ammonia in a solution of ammonia and precipitating nickel from solution by addition of a salt capable of displacing nickel.

PROCESS OF PRECIPITATING AND RECOVERING PRECIOUS METALS FROM THEIR SOLUTIONS.—No. 689,190; B. Hunt, San Francisco, Cal.

Adding to pulp a cyanide solution and agitating

same, until metal is extracted; then adding to pulp while continuing agitation, powdered metallic aluminum wherehy precious metal is precipitated, but in suspension in pulp; then adding mercury and continuing agitation until metal is in form of an amalgam, and finally recovering precious metal hy treating amalgam.

PROOESS OF EXTRACTING COPPER FROM ORES.—No. 689,835; G. H. Waterhury, Denver, Colo.



Placing the pulverized ore in a leaching tank with such water and acid as may be necessary, and introducing hot air into tank, drawing off copper solution formed into a tank or receptacle containing pieces of iron small enough to allow solution to pass readily therethrough, and finally introducing hot air into solution.

Latest Rulings Under the Mining Laws.

The following are officially furnished hy the Commissioner of the General Land Office and are the latest in each instance:

Placer—Form of Location.—Within the meaning of Section 2331 of the Revised Statutes all placer mining claims located after May 10, 1872, must "conform as near as practicahle with the United States system of puhlic land surveys and the rectangular suhdivisions of such surveys," whether the locations are upon surveyed or unsurveyed lands. (Miller placer claim, 30 L. D., 225.)

Placer — Non-contiguous Tracts. — There is no authority under the mining laws for the location of a placer claim in two or more non-contiguous tracts, either hy an original or amended location, although the purpose of such location may he to include tracts separated hy intervening surveys or claims. (Otto Schulz et al., Acting Secretary, Septemher 22, 1900.)

Placer—Form of Location.—A placer claim over 16 miles long and ahout 51 feet wide is heyond all bounds of reason, and the entry thereof cannot he sustained. Such was never contemplated hy Congress. (Taylor Park Mining Co., Secretary, Octoher 6, 1900.)

Expenditure.—No part of the value of permanent and immovahle improvements on a mining claim, made long prior to the location thereof hy claimants under a previous location embracing the same ground, solely to improve and develop the prior claim, can he credited to the latter toward meeting the requirement of the statute "that $500 worth of lahor has heen expended or improvement made upon the claim hy himself (the claimant) or grantors." (Yankee lode claim, 30 L. D., 289.)

Practice—Rule 43.—Rule 43 is applicable in all cases of default hy protestant, and is equally applicable in case hoth parties make default. Where protestant makes default it is not in the power of the protestee to prosecute the case within the meaning of said rule 43, neither is it ohligatory upon the register and receiver to hear testimony of contestee's witnesses. If, however, their testimony is received, a decision thereon is not permissihle, hut the case must he dismissed for want of prosecution under the rule. (Charles Ross v. Central Pacific Railroad Co., Acting Commissioner, Octoher 23, 1900.)

Crystalline Deposits.—Crystalline deposits and formations of that character, such as stalactites, stalagmites, geodes, "hox work," "frost work," etc., found in caverns, and which suhstances are valuable solely as mineral curiosities, and disposed of as such, are not minerals within the purview of the mining laws. (South Dakota Mining Co. v. McDonald, 30 L. D., 357.)

Coal Filing—Isolated Tract.—The filing of a Coal D. S. upon an "isolated or disconnected" tract takes it out of the category of such lands, and while the filing remains on record, irrespective of the fact as to whether it has expired hy limitation or not, constitutes such cloud of incumbrance upon the title as to render the land not subject to homestead entry within the meaning and intent of the Act of February 26, 1895, as construed hy the Department in Hand v. De Remer (26 L. D., 676), and that the three years contemplated hy said Act will not commence to run again until such time as the Coal D. S. shall have heen formally canceled. (Montie Blevins, commissioner to register and receiver, Denver, Colo., February 11, 1901.)

Application — Exclusion — Laches. —When claimants elect to make application for patent under Section 2325, Revised Statutes, for part of the claim only, and to proceed, at the same time, as to the remainder of the claim under Section 2326, Revised Statutes, their proceedings upon such application can not he delayed in the Land Department to await the final issue of the proceedings in court. (Little Annie No. 5 lode claim, 30 L. D., 488.)

Mining Applications—Conflicting.—Where an application for patent is filed for land covered by a prior location, the second application is to he treated as excluding the conflict. Under such conditions a judgment ohtained hy third parties against the second applicants for the conflict hetween the two applications is not a judgment under Section 2326 of the Revised Statutes, and hence not of binding force upon the Land Department. (Golconda lode, Acting Secretary, March 30, 1901.)

Mineral Entry — Laches.— The Department will consider laches, notwithstanding the question is not raised hy protest, or, if raised, has been suhsequently waived by protestants. (J. C. Ahby and Thos. Ross v. The Apothecaries Gold Mining Co., Acting Secretary, April 2, 1901.)

Mining Claim—Discovery.—Where it appears that that portion of a mining claim containing the discovery has heen excluded from the application for patent, because of conflict with another claim, the applicants may he allowed to show that a new discovery has been made within the lines of the claim and upon the ground otherwise unappropriated, provided that if such discovery was not made at or prior to the commencement of the period of puhlication of notice it will also he necessary to give a new notice of application as to that claim hy puhlication and posting in the usual manner. (Alice K. and other lodes, Acting Secretary, April 11, 1901.)

Mineral Land—Oil—Classification.—Land can not be classified as mineral (oil) unless it he shown that mineral has been developed thereon. A slight scum of oil found upon the surface of water standing in small holes is not sufficient to constitute a discovery of valuahle mineral within the meaning of the mining laws. The fact that oil has heen developed on lands in the vicinity can have no controlling influence in such a case. (Acting Secretary, June 8, 1901.)

Laches.—Delay of effort to perfect a right to a patent under a judgment ohtained in adverse proceedings in the courts is equally effective as a waiver of such right as is delay in the prosecution to completion of an application for patent. (Fraction lode claim, Secretary, June 29, 1901.)

Location—On Dip of Vein.—A location made upon the dip of a vein or lode having its top or apex within the surface houndaries of a prior location is invalid. (The Shoshone Mining Co. et al. v. The Bunker Hill & Sullivan Mining & Concentrating Co., Commissioner, July 18, 1901.)

Forest Lieu Selection—Act of March 2, 1899 (30 Stat. L., 994).—The Northern Pacific Railroad Co. is not authorized, under Section 3, Act of March 2, 1899, to make selection in lieu of non-mineral lands, in the Pacific Forest Reserve, of lands valuahle for coal or iron, such lands heing mineral lands within the contemplation of the mining laws and suhject only to disposal thereunder. (Ulfers Brown v. N. P. R. R. Co., Secretary, July 16, 1901.)

School Indemnity Selections.—In school indemnity selections the lands in lieu of which indemnity is claimed should he described according to their legal suhdivisions. A description such as "40 acres in Section 16" is altogether uncertain and inadequate. (Samuel Bond et al. vs. State of California, Secretary, July 17, 1901.)

REGULATIONS UNDER UNITED STATES MINING LAWS, APPROVED JULY 26, 1901—IMPORTANT CHANGES.

Placer Claims—Legal Suhdivisions Must he Contiguous.—By Section 2330 authority is given for the subdivision of forty-acre legal suhdivisions into ten-acre lots, which is intended for the greater convenience of miners in segregating their claims hoth from one another and from intervening agricultural lands. It is held, therefore, that under a proper construction of the law these ten-acre lots in mining districts should he considered and dealt with, to all intents and purposes, as legal suhdivisions, and that an applicant having a claim which conforms to one or more of these ten-acre lots, contiguous in case of two or more lots, may make entry thereof, after the usual proceedings, without further survey or plat. (Par. 22, Mining Circular, approved July 26, 1901.)

Placer Claims—Upon Unsurveyed Lands.—The regulations hereinhefore given as to the manner of marking locations on the ground and placing the same on record must he ohserved in the case of placer locations so far as the same are applicahle, the law requiring, however, that all placer mining claims located after May 10, 1872, shall conform as near as practicahle with the United States system of puhlic land surveys and the rectangular suhdivisions of such surveys, whether the locations are upon surveyed or unsurveyed lands. (Par. 30, Mining Circular, approved July 26, 1901.)

Mineral Entry Transfers Suhsequent to Application Not Considered.—No entry will be allowed until the register has satisfied himself hy careful examination that proper proofs have heen filed upon the points indicated in the law and official regulations. Transfers made suhsequent to the filing of the application for patent will not be considered, hut entry will he allowed and patent issued in all cases in the name of the applicant for patent, the title conveyed hy the patent, of course, in each instance inuring to the transferee of such applicant where a transfer has heen made pending the application for patent. (Par. 71, Mining Circular, approved July 26, 1901.)

Conflict in Rule Between the U. S. Supreme Court and Land Department.

TO THE EDITOR:—In last week's "Concentrates" it was stated that "some time ago the Commissioner of the General Land Office ruled that thereafter when mining claims conflicted there could he no compromise between the claimants." This is not in harmony with the decisions of the United States Supreme Court.

In St. Louis Mining Co. vs. Montana Mining Co. (171 U. S., 655), the proposition was that where an application to enter a mining claim is made, and there is embraced therein land claimed hy another, it is the duty of the latter to file an adverse claim and thereafter hring in some court of competent jurisdiction an action to determine the right to the area in conflict, which action must he prosecuted to a final judgment or dismissed; and that no valid settlement can be made by which such adverse claimant can acquire any interest in the ground when thereafter patented hy the applicant.

Upon this suhject the court said that it was not aware of any public policy of the Government which is to he found in the Constitution and the laws, and the course of administrations and decisions, which sustains this proposition.

Where there is a valid location of a mining claim, the area hecomes segregated from the puhlic domain and the property of the locator and his successors in interest. There is no inhihition in the Mineral Lands Act against alienation, and the claimant may sell it, mortgage it, or part with the whole, or any portion of it, as he may see fit, and his contracts for a sale, etc., are legal and will he enforced hy the courts. And that where an application to enter a mining claim embraces land claimed hy another, the latter is under no ohligations to file an adverse claim, but he may make a valid settlement with the applicant hy contract which can he enforced against him after he obtains the patent.

In Lamh vs. Davenport (18 Wall., 314), the court said that the right of the United States to dispose of their own property is undisputed, and to make rules hy which the lands of the Government may he sold or given away is acknowledged; hut subject to these well known principles, parties in possession of the soil might make valid contracts, even concerning the title, predicated upon the hypothesis that they might thereafter lawfully acquire the title, except in cases where Congress has imposed restrictions on such contracts.

The theory of the homestead law is that the homestead shall be for the exclusive henfit of the homesteader. Section 2290 of the Revised Statutes provides that a person applying for the entry of a homestead claim shall make affidavit that, among other things, "such application is made for his exclusive use and henefit, and that his entry is made for the purpose of actual settlement and cultivation, and not either directly or indirectly for the use or henefit of any other person." And Section 2291, which prescrihes the time and manner of final proof, requires that the applicant make affidavit that no part of such land has heen alienated, except as provided in Section 2228, which section provides for alienation for "church, cemetery or school purposes, or for the right of way of railroads." The law contemplates five years' continuous occupation of the homesteader, with no alienation except for the named purposes. It is true that the sections contain no express prohihition of alienation, and no forfeiture in case of alienation; yet, under them the homestead right can not he perfected in case of alienation, or contract for alienation, without perjury hy the homesteader.

In the case of mineral lands there is no statute which in express terms, or hy any fair implication, forbids the making of a contract for the purpose of settling and compromising an action hetween conflicting mineral claimants, and there is no reason in law or equity why such a contract should he held to he illegal or forhidden.

In conclusion, it may he said that the law favors the settlement of disputed matters without recourse to litigation. A. H. RICKETTS.

THE annual report of the Montana mine inspector states that the depth in feet of the shafts of the principal mines at Butte are: Anaconda, 1800; Never Sweat, 2000; Diamond, 2200; Bell, 1700; High Ore, 2200; St. Lawrence, 1800; East Colusa, 900; Leonard, 1200; West Colusa, 1500; Mountain View, 1800; Silver Bow No. 1, 1000; Silver Bow No. 2, 2700; East Gray Rock, 1600; Blue Jay, 1075; Original, 1300; Colusa-Parrot, 1400; Stewart, 1150; Rarus, 1300; Minnie Healy, 900; Gagnon, 1800; Parrot, 1500; Speculator, 1400; Moonlight, 1300.

IT is said that the total area of the gold fields of Western Australia is over 324,000 square miles, or just one-third of the area of the colony itself.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

JUNEAU.

On the Yellow Jacket mine, at Wyndham bay, J A. Mays, Supt., is arranging for the erection of buildings for at least two 10-stamp mills, and it is reported will probably order buildings for twenty additional stamps and concentrators. The mine upon which the company will put these mills has been bought from Mays & Barclay for $10,000, and consists of the Gray Eagle group of free gold claims, mill site and water rights. The vein upon the claims is said to be over 16 feet wide, a contact between slate and schist, carrying values in free gold, running from $10 upward. The Yellow Jacket is a Seattle, Wash., corporation, T. H. Ellis, president, and C. Moulton, secretary.

KETCHIKAN.

The Ketchikan G. M. Co., at Sea Level, is opening its mine by a tunnel half a mile inland from the harbor and 400 feet above the sea level. There is a 5-foot ledge of free-milling ore which runs $9 to the ton and development work will continue during the winter preparatory to putting in a mill.

Mellen & Reynolds, at Coppermount, on Prince of Wales island, have made the fifth shipment of 200 tons of ore to the smelter. It runs 30% copper. Development work is to continue. Prospects are for monthly shipments of 200 tons.

ARIZONA.

COCHISE COUNTY.

At the Tombstone Mines Co.'s combination shaft levels are being run, during the course of which ore bodies are met, but no stoping is being done, this work being development. At the company machine shops the old machinery is being overhauled and prepared for use.

About six months ago J. J. Pearce bought from L. D. Redfield a gold claim near Benson upon which a shaft was down about 60 feet. Mr. Pearce has now sunk the shaft to a depth of 125 feet, and has opened a body of free-milling gold ore for the reduction of which it is reported he will shortly erect a mill.

GILA COUNTY.

Supt. W. S. Sultan of the Arizona Commercial Co. has received instructions to resume sinking on the Copper Hill mine at Globe. The shaft is now down 415 feet and will be sunk 200 feet deeper.

C. W. Slack, assayer for the Pinal Copper Co., states that owing to the decline in the price of copper, ore shipments from the Black copper mine at Globe to El Paso have been discontinued and ore sorters have been laid off. Development work, he states, will be continued, however, as heretofore—sinking the double compartment shaft, which is down nearly 300 feet and opening the 200-foot level.

Supt. Whipple of the Globe-Boston C. Co. states that the sinking of the double-compartment shaft on the I X L claim at Globe will be resumed, and as soon as the pump is installed the company is prepared to carry on development work regardless of the price of copper.

D. Gibson of the Columbia C. Co., near Globe, states that the double-compartment shaft is down 310 feet and continues in high-grade chalcopyrite ore.

T. Crandall, Supt. of the Del Shay gold mine at Tonto, says recent development work has opened the ore body at a considerable depth. The Del Shay property is under bond to St. Joe, Missouri, people, most of whom are officers and stockholders in the Pinto Creek M. & S. Co.

GRAHAM COUNTY.

At the Copper Belle M. Co., G. M. Ruff manager, 18 miles from San Carlos, work is being done on the tunnel and in the shafts. The tunnel is being run to cut the vein down 400 feet from its apex. The ore is copper sulphide. The company says it will put up a smelter as soon as the tunnel has opened up the vein.

MARICOPA COUNTY.

Goldberg Bros. of Phœnix are placer mining near Wickenburg with ten men employed. So far all the gold has been found on the surface, the formation being an immense white quartz blowout, but Goldberg Bros. are having a shaft sunk.

MOHAVE COUNTY.

At the Planet copper mines two gasoline hoists have been installed and a two-compartment shaft will be sunk 500 feet.

The Maguire gold mines, near Kingman, it is reported, are to be opened up by a tunnel started on the west end of the claims.

PIMA COUNTY.

The San Xavier mines, near Tucson, operated by the American Zinc Co., Supt. Forbes, have been extensively developed. More than 4000 feet of openings have been made, including the main shaft 550 feet deep. More than 150,000 tons of ore is claimed to be blocked out. The ledge at the lowest workings is said to be over 45 feet wide, containing lead, copper, silver and gold. There are three hoists on the mine and 10,000 tons of ore on the dumps.

SANTA CRUZ COUNTY.

The Jefferson group of mines in the Patagonias, near Patagonia, consisting of the Lead Queen, Grizzly, Wedge, Rosina and Help Me, have been sold to Eastern people, represented by A. C. Coffey, who had a bond on them and has been doing development work for the past six months.

YAVAPAI COUNTY.

A strike has been made at the Home Run mine on Groom creek near Prescott. This mine was bonded by D. Moynahan and associates of Niles, O., about a year ago and has been under development since. Lately in both drifts on the lower level large bodies of high-grade gold and silver ore have been encountered.

On the Victor mine at Groom Creek, near Prescott, G. Woods is grading for the erection of a stamp mill.

YUMA COUNTY.

(Special Correspondence).—The King of Arizona, 40 miles north of Mohawk Summit station, employs about 100 men in the mine and mill. The property is opened through a crosscut tunnel to the vein, on which there is approximately 3000 feet of drifting. There is also a 200-foot shaft near the tunnel entrance, from which there are two levels. There is also a large amount of open-cut work from which ore has been taken. The vein is regular, of quite uniform width, with walls well defined. It is believed to average 20 feet wide. The ores comprise a quartz stained with iron and manganese, carrying visible free gold.

The mill is equipped with crusher, rolls and screens for dry crushing, the necessary lime being added during the crushing process. The pulp, reduced to sixteen and twenty mesh, is conveyed to the cyanide leaching vats, of which there are seven of 250 tons capacity each.

The crushing capacity of the mill is about 125 tons in twenty-four hours. The property has been working about three years. The water supply is pumped from a 1100-foot bored well 5 miles away, being raised 1450 feet to the tanks above the mill.

Kofa, Ariz., Dec. 31.

CALIFORNIA.

AMADOR COUNTY.

People interested in the Anita and Kennedy mines are negotiating to buy the Good Hope mine, at Jackson. The Anita company, having explored the ground west of the Good Hope and not finding the Kennedy ledge, the latter, it is now believed, must be in the Good Hope ground, and, if the mine is sold, it will be explored by a deep shaft to determine whether or not it contains the Kennedy ledge.

In the Argonaut, at Jackson, sinking operations are being pushed steadily. Ten stamps of the mill are kept running on half time on ore from the Hoffman ground. The point where the ore is being extracted is about 2000 feet from the Argonaut shaft, and work is much hampered by distance and lack of ventilation. It is understood, however, that the ore body has improved in size and quality and indicates that a paying mine has been discovered within the limits of the Hoffman ranch, owned by W. F. Detert, but under option to the Argonaut Co.

The shaft at the Zeila mine is undergoing repairs, and Supt. Detert says that it will take until February before they are completed. During the repair work about half the usual working force is laid off.

At the east shaft of the Kennedy mine, at Jackson, a little over 2700 feet in depth has been attained and preparations are under way for drifting to the ledge from the 2400 and 2550-foot levels.

CALAVERAS COUNTY.

J. J. McSorley has given Eastern people a sixty-day cash option to buy the Hexter placer mine at Mokelumne Hill. They are putting in an air compressor to work on the mine at once. This claim covers one of the old gravel channels. About 1200 feet of it was worked by early-day miners. The other end, about a mile distant, was also very rich, but the middle portion, on account of the great quantity of water, could not be worked advantageously. The Hexter tunnel is projected to drain this ground.

The Iowa Con. mine, at Rich Gulch, owned by Iowa and New York people, is being opened by a 400-foot tunnel, which will tap the vein 200 feet deep. The tunnel is now in 127 feet in very hard quartzite. A. Laidet is foreman.

The Wright & Lane mine will soon start its 40-stamp mill, using electric power from Knight's Ferry, a distance of about 8 miles. The hoist will be run by compressed air and the compressor by electricity. Direct water power will be used for the rock breaker, the water being conveyed through a pipe from the company's dam on Littlejohn creek, and the same water will be afterwards utilized for the stamp batteries.

The Sultana mine at Angels Camp is being worked. The Bovee shaft is unwatered and retimbered to the 250-foot level and the 20-foot sump cleaned out. The Fritz shaft is down 120 feet, with an 8-foot ledge of good rock. The mill is also being overhauled. An air compressor and a new hoist will be put on the Fritz shaft.

EL DORADO COUNTY.

It is said that the Pacific mine, at Placerville, will resume operations shortly. The principal owners live in England. Foreman Evans expects to put men at work soon.

MARIPOSA COUNTY.

The Garibaldi mine at Kinsley is handling daily 3600 tons of water, from 60 to 70 tons of waste and 40 tons of ore. The five stamps of the mill were recently started. More stamps will be added soon. The ore is taken from two parallel veins about 10 feet apart. The shaft is down 355 feet and will be sunk deeper as soon as the ore from the upper levels is stoped out.

It is reported work will soon be resumed at Mt. Gains and the old Martin mine at Quartzburg. The 10-stamp mill at Elkhorn is running.

In the Mariposa mine, at Mariposa, on the second level, a crosscut in the footwall 400 feet from the shaft has struck a 3-foot vein of good ore which has been followed 60 feet. The station at the 1000-foot level is completed and drifts have been run 100 feet both ways. The vein is from 2 to 5 feet, the value of the rock being fully as good as in the upper levels. The shaft is down 70 feet below this station. The west drift at the 500 level is in 400 feet and follows a 3-foot vein. Stoping is being done east and west at 500 level and west at 600 and 800 levels.

MONO COUNTY.

Philadelphia people have taken an option on a part interest in the group of claims, near Benton, owned by S. G. Lines and J. B. Cowrie, and are having prospecting work done on them. The ores carry gold, silver and copper.

NEVADA COUNTY.

The Ironclad M. Co. has bought the 100-acre ranch of Mrs. J. Miller at Rough & Ready, for $2250, Supt. Hay acting for the company.

D. Voss, who recently leased the Welch mine in Willow valley, near Nevada City, is having the old shaft retimbered. It will be pumped out and sunk deeper.

The pump at the Grass Valley Con. has been started up and is clearing the mine of water, which Supt. Coffin expects to have accomplished in about two weeks. As soon as the mine is dry, the work of sinking will be commenced. The pump and an electric hoist for the mine will be run by electricity.

The owners of the California mine at Nevada City have decided to install electric power at the mine. The hoisting at present is done by steam power; G. Levensky manager.

A slide of rock and earth occurred at the Champion mine at Maybert, which is owned by Dr. Tickell of Nevada City and others, and has crushed in the rear of the mill building and struck the concentrators, doing considerable damage.

A new rock breaker has been put in at the Grizzly Hill drift gravel mine, near Nevada City, to break the big pieces of cement gravel, which is very hard. After it is reduced in size it will pass into the machine which was recently taken to the mine to work the gravel. At present men are engaged in opening up some ground from which gravel will be extracted.

PLUMAS COUNTY.

W. Malcom states that at the Crown Point mine, near Quincy, the building for the quartz mill is completed and the machinery is being installed. Lesher & Gobert are the owners.

SAN DIEGO COUNTY.

(Special Correspondence).—The American Girl mine, 4 miles northeast from Ogilby, is worked through a 600-foot incline, which cuts under the ore body, levels from the incline being run to the ore in different directions. The ores are an iron and copper sulphide, carrying high values in gold. A mill on the mine is equipped for dry crushing, concentration and cyanide work. It has eight standard tables, which make a heavy, clean concentrate. The tailings, carrying the silica and slimes, are cyanided, there being six 100-ton leaching tanks and two of fifty tons each. Thos. Johnson is mine Supt.. J. E. Healey in charge of the cyanide work and Oscar Otterson the concentrators. About 100 tons of ore and waste daily are being hoisted. The supply of water is pumped from the Colorado river. Oil burners are being put under the steam boilers. It is expected they will ship 100 tons of concentrates per month.

Ogilby, Dec. 24.

SACRAMENTO COUNTY.

The Asbburton Dredging Co., operating between Fair Oaks and Folsom, it is said is realizing nearly $1300 daily with its machine. Hanford Bros., in the same district, have one dredge in operation and have placed an order for two more. The Zelma Bell G. M. & Dredging Co. owns 140 acres of gold-bearing gravel on the North Fork of the American river, which pays from $1.73 to $5 per yard on the bedrock. They have let a contract for a dredger and will begin operations early next month.

SHASTA COUNTY.

There is a fire in the ore body of the Iron Mountain mine, near Redding, and the property is closed. The management announces that the closing is temporary, to allow the workmen a rest during the holidays, and that the fire is not serious, the intention being that full operations will be resumed after January 1st.

The Sunny Hill mine, near Ono, is said to be taking out good quartz. Smith & Doll have sold out the water right and all their claims to the Marina Marsicano G. M. Co. of San Francisco.

The Bully Choop mine has closed down until spring.

SISKIYOU COUNTY.

F. Alger and J. L. Barry of Callahans, owners of the Hornet and Wasp mines, near Gazelle, have run a tunnel 180 feet, opening a 5-foot ledge of promising quartz.

At the Bumble Bee mine, near Callahans, F. Alger, the owner, says the ore assays $12 gold, fourteen ounces silver and 10% copper.

The King Solomon mine, near Cecilville, is running with about twenty-five men under J. A. Thompson, manager. The mine is to be run all winter.

Thirty men are employed at the Summerville hydraulic mine under the management of Belfrey & Long. They are making preparations for a long run when the water supply is on The company has bonded Hillyer & Tuttle's placer mine adjoining at $15,000.

The Van Brunt M. Co. at Happy Camp district are working their hydraulic mine with two No. 5 giants. Water is brought through their 18-mile ditch out of the south fork of Indian creek. They have recently installed a 45-light electric plant, and during the summer run 500 feet of tunnel to drain a large area of ground that would require too deep a cut to bedrock to be safe. The company are now using steel rails for riffles, having hauled from the railroad at Montague 75,000 pounds.

The hydraulic mine at Portuguese creek, at Seiad, owned by Wood & Cuddihy of Happy Camp, is being operated this season under the supervision of D. Cuddihy.

The old John Brown mine at Cottage Grove, which was bought by Reno, Nev., people, is being prepared for the winter run. F. M. Drumm is Supt.

J. T. White, formerly Supt. of the Minetta B. mine at Nolton, and J. W. Martin have leased the Minetta B. and are now working the mine with a head of water from Thompson creek.

Supt. A. C. Brokaw of the Quartz Valley hydraulic mine, near Oro Fino, is installing a large hydraulic elevator. Four giants are in active operation at the mine with an abundance of water in the ditches. The claim is fitted up with an acetylene gas plant for work during the nights. Mr. Brokaw has also fitted up a quartz mill at Hull gulch, which crushes quartz from a ledge lately discovered at the lower end of the hydraulic claim.

TRINITY COUNTY.

(Special Correspondence).—At the Dorleska, at Abrams, the new 3½-foot Huntington mill commenced work Dec. 8th, replacing the small prospecting mill, which had been working since June 3d. The latter, with a capacity of but a little more than a ton per day, has reduced 184 tons, and turned out fifteen bars of bullion, from which the U. S. Mint has returned $32,191.47. Of this, forty-six tons, classed as "bonanza" ore, yielded $25,376 87, or $551.67 per ton. The remaining 138 tons of second-class ore gave $6814 60, or $49.38 per ton. This was entirely of free gold, amalgamated in the battery and on the plate. In addition there are about 2% of concentrates, those from the richest ore being of high-grade, saved by a Woodbury concentrator. The new mill starts with about 600 tons of second-grade ore on the dump, all of which, together with that which has been reduced, having been taken out in the development work. During the past season about 1000 feet of tunnel and drifts have been run, and 180 feet

of shaft and winze sunk. Wagon roads and trails have been made, and a sawmill, shaft house, bunk house, barn, store and other buildings have been constructed, and several hundred acres of timber lands purchased adjoining the mines. During the winter about fifteen men will be employed in sinking the shaft and running a third level, and in addition a long tunnel is being run on contract. Union Consolidated Gold Mines Co., of Los Angeles, owners; H. Z. Osborne, president and general manager; M. H. McIlwaine, superintendent.

The Trinity County G. M. Co. of New York City has been incorporated, capital $1,000,000, to work Trinity county gold mines; G. Cox, Jr., T. O. Callendar, F. J. Kilnea and G. Wilcox of New York City, P. J. Bradley of Boston, Mass., and J. Hinchcliffe of Patterson, N. J., are the directors.

TUOLUMNE COUNTY.

At the Vine Spring mine, near Columbia, the pay shoot struck in the upper tunnel has been found in the lower tunnel, showing 18 inches of high-grade ore. The erection of a mill on the property is being talked of.

J. Schoenfeld and D. Adler have sold to L. Radovich and W. Smith of San Francisco the Possible mine, situated near Columbia.

W. B. Buckminister, E. H. Mason, C. C. Jackson and W. C. Forbes, all of Boston, Mass., have deeded the Erin Go Braugh and Cloudman quartz mines to the Harvard G. M. Co. for $350,000, paid by 70,000 shares of stock.

The 5-stamp mill on the Wild Cat mine, near Soulsbyville, has started up. C. G. Grimm is Supt. He has twelve men at work sinking the shaft and clearing out the old workings.

The Century G. M. Co. of Pittsburg, Pa., operating at Tuttletown, capital $200,000, has been incorporated by A. M. Schoyer, S. C. Scott, L. B. Taylor, G. M. Merritt and J. Lee, all of Pittsburg, Pa.

In the Von Tromp mine, steam power is to be used by Stanford and associates in the proposed mining operations to strike the Table Mt. channel. A 60 H. P. engine will be used for the hoist. The work of sinking the shaft has been commenced.

YUBA COUNTY.

Arrangements have been made by which several old mining claims at Brown's Valley will be extensively developed. The deal includes the Dannenherg, Pennsylvania, Jefferson and the land owned by T. J. Hibbert. It is understood that all of these owners have bonded to sell for eighteen months. The conditions of the bond require the expenditure of at least $50,000 in development work. The Pennsylvania and Jefferson have been rich mines, but the lode or veins worked were found broken, and at times disappearing in the drifts. A mill on one of the claims is being kept at work most of the time on ore from the old openings. Manager L. Scrutton is arranging for putting more men at work in the near future.

COLORADO.

BOULDER COUNTY.

Boulder county production for 1901 is as follows:

Gold production	$790,700
Silver production	128,920
Other metals	109,280
Total production	$928,900

The contractors on the Cornucopia tunnel, at Ward, have finished their contract and the tunnel is now in 350 feet. A contact vein has been cut which is 8 feet wide. The pay streak is 3½ feet wide.

CHAFFEE COUNTY.

The Buena Vista S. & R. Co.'s plant at Buena Vista was destroyed by fire on the 21st ult., the loss being about $75,000. It contained one pyritic furnace, with a capacity of 150 tons daily, and had been operated continuously since it was constructed in 1889. It was an independent concern and was under the management of B. F. Morley. The plant will be rebuilt and will have its capacity trebled.

The production of Chaffee county for 1901 is estimated at $382,439.22 in gold, silver, copper and lead. Of this the Cache creek placers at Granite produced $30,662 in gold, the Mary Murphy, at Ramley, $6116 in gold. Gold washed from the Arkansas river, $600. The smelter produced about $48,533 in gold.

CLEAR CREEK COUNTY.

The Mint property, at Empire, has been taken over by the Metallic Extraction Co., which will develop the group and install a mill for handling economically the low and medium-grade output. Numerous mill returns show grades of ore from $60 for the smelting down to $8 for the crude concentrating product. The old Knickerhocker mill site at Empire, with its water power, has been leased by the company.

The Newhouse tunnel from Idaho Springs is progressing toward the California mine, on Quartz hill, having reached a length of nearly 1500 feet, and is being driven at a rate of nearly 300 feet per month. The beading is now beyond the Kokomo mine, in Gilpin county. It is expected that the Saratoga mine, at Russell gulch, will be cut during 1902, and the manager will sink the shaft on that mine so as to make a connection with the tunnel for ventilation and drainage.

Idaho Springs during 1901 shipped 1422 cars carrying 28,440 tons of ore, containing values amounting to $1,564,200, which represents a gain of 35% over the output of 1900. The number of miners employed is estimated at 1600; average wage per day, $3; monthly payroll for the district, $35,000, and the total paid miners during the year, $420,000. The district has three sampling mills, having a capacity of 230 tons per day, and eighteen concentrators, equal to handling 850 tons a day.

The East Argentine T., M., M., P. & T. Co. has been organized at East Argentine; M. Wheeler is president, R. A. Leisy secretary and treasurer and M. Sidney manager. The properties of this company consist of 100 acres of mineral lands at East Argentine, upon which some development work has been done. The projected tunnel is to open up the mining claims of the company and will cut the veins about 1000 feet lower than any of the other projected tunnels in the district.

GILPIN COUNTY.

The shipments during 1901 from Black Hawk of smelting ore and tailings to the smelters, and mill or concentrating ore to the concentrators, show a gain over 1900 of about 11,000 tons. In 1900 the total shipments were 58,689 tons, to which was added 10,000 tons which was hauled to Idaho Springs by wagon from Russell Gulch. In 1901 the railroad shipments were 69,348 tons, to which is added 11,000 tons sent to Idaho Springs by wagon, making a total of 80,348 tons.

The shipment of gold from Black Hawk banks to the Denver Mint for 1901 aggregate $510,000. Considerable gold is taken to the mint and refining establishments by individuals of which there is no record.

Taking the bank shipments of gold and the value of the ore shipped, the yield of Gilpin county for 1901 was as follows:

80,348 tons of mineral	$3,440,000
Bank shipments	510,000
Total	$3,950,000

GUNNISON COUNTY.

The old Eureka-Nest Egg, at White Pine, which, it is said, has yielded $1,500,000, after a long shut down is now, under Manager D. C. Tobin of Leadville, making a monthly output of 400 tons of carbonates and sulphides.

The Kentucky Gulch M. Co., which has been operating at Tin Cup this year, reports a discovery of a body of fluorspar ore 12 feet wide—a marketable product at the smelters.

The Forest Hill M. Co., at Tin Cup, has its new mill ready to operate on its low-grade ores. Besides several thousand tons of ore already mined, there is said to be blocked out in the workings several times as much.

HINSDALE COUNTY.

Supt. P. Newman of the Sherman G. M. Co., at Lake City, states that a small streak of bismuth ore has been encountered in the mine, which assay returns show to run about $400 to the ton.

LAKE COUNTY.

The Colorado-Manhattan G. M. & L. Co. has been organized by C. W. Lininger, S. G. Kahn, M. Kahn, A. Milks and W. Keenholts of Leadville, with $600,000 capital. The company has a five-year lease on eighteen acres of ground at Leadville in which a diamond drill hole 500 feet deep disclosed high-grade sulphides.

Leadville produced a total for the year of about 750,000 tons of ore, with a total valuation of $15,000,000.

MESA COUNTY.

J. V. Howard of Grand Junction says he has an offer to build a pyritic reduction furnace of 100 or 200 tons daily capacity at Grand Junction. The preliminary steps have already been taken to organize the company and work on the plant is expected to commence soon.

MINERAL COUNTY.

The United Mines Co. of Creede recently declared its first dividend of $12,500. It is understood that the showing in the mine is good.

OURAY COUNTY.

The Camp Bird Extension Co. has bought from G. L. Wright the Hoosier Girl and Richmond claims in the Imogene basin, at Ouray, and also a millsite.

Ore shipped from Ouray during the year 1901 was 1564 cars, a decrease of 355 cars under the preceding year. The values, however, of this year's shipments largely exceeded those of 1900, owing to the fact that a large proportion of the cars contained concentrates from the mills. The output of the county for the year 1900 was, in round numbers: Gold, $2,131,000; silver, $1,807,541; lead, $433,548; copper, $71,901; which was increased in 1901 to gold, $2,138,000; silver, $1,800,000; lead, $430,000; copper, $71,000.

PITKIN COUNTY.

The output in tonnage for 1901 of Pitkin county is about 110,000 tons. Of this about 71,500 is milling and 35,500 smelting ore. The average value per ton in silver is close to fifty ounces and 4½% lead, as follows:

88,000 tons low-grade ore at $6.50	$572,000
2,000 tons high-grade ore at $20	40,000
20,000 tons concentrates at $30	500,000
110,000 tons ore output, value	$1,212,000

The average number of men employed for the year just past by both companies and leasers is about 1500. The payroll for the month will approximate $135,000.

SAN JUAN COUNTY.

San Juan county's output in the four principal metals in 1901 is as follows:

Gold	$1,500,000
Silver	1,450,000
Lead	825,000
Copper	250,000
Total	$4,025,000

SAN MIGUEL COUNTY.

The output of San Miguel county for 1901, by mines, is as follows:

Smuggler-Union	$ 833,900
Tom Boy	819,800
Liberty Bell	612,500
Carribeau Montezuma	156,000
Butterfly-Terrible	125,400
Ophir Consolidated	70,600
Alta Mines Co	45,600
Milwaukee Ophir	40,000
San Bernardino	57,000
Gold King	55,000
Peck Cyanide	55,000
Miscellaneous shipments	127,000
Total	$2,997,400

Shipments of crude ore and concentrates from railroad stations in San Miguel county, by carloads, have been as follows:

	Cars.
From Telluride station	1,546
From Ophir station	542
From Placerville station	51

SUMMIT COUNTY.

The Howard M. & M. Co. has been incorporated in Maine, capital $100,000, to operate a group of free-milling gold lodes near Breckenridge. A. C. Howard of Breckenridge is president and manager and J. F. Derwin, Jr., secretary and treasurer.

The Royal Mountain lode and Royal placer claims at Breckenridge have been sold to the King Solomon T. & M. Co., composed of Pueblo and Colorado Springs people. The company is preparing to complete the tunnel and is building a tunnel house.

TELLER COUNTY.

The owners of the Sand Burr mine, near Cripple Creek, are proposing to build a mill to treat their ores. They claim to have a mountain of low-grade rock which can be mined and sent to the mill for about $1 to $1.50 per ton. Recently they have had cyanide treatment tests made satisfactorily. There is water power available to run the proposed mill, and it is estimated that $4 ore will return a profit of $1 per ton to the company.

E. A. Stevens, who is operating on the Golden Wedge claim of the Mary Jane Co., at Cripple Creek, has decided to order a new hoist to sink 1000 feet. It is his intention to sink to the 500-foot point, cutting stations every 100 feet.

The annual report of the Doctor-Jack Pot Con. M. Co., at Victor, shows that during the nine months terminating October 31 the mine shipped $645,998.83 worth of ore and the lessees $52,259, making a total of $698,258 36. The principal disbursements of the year were: Dividends, $232,000; operations, $228,720.70; transportation, $108,110.94; transportation and treatment of lease ore, $15,523 39; general mine office expense, $14,524.39. The report further shows that the company has $35,309.76 in cash. F. M. Woods is manager.

The lessees operating the Echo Co.'s property at Cripple Creek have decided to install a steam plant of machinery, which will include boilers and a hoist, to sink 500 feet. A compressor may also be included in the improvements.

The Cripple Creek & Colorado M. Co., operating at Cripple Creek, has let the contract for a large plant of machinery for the A shaft, which the company intend putting down to a depth of 1000 feet immediately. The hoist will be good for the depth of 2000 feet.

A partial list of the ore production and gross value made by the mines operating in the Cripple Creek district, as furnished by the companies for the year ending 1901 is as follows:

	Tons.	Value.
Portland	95,000	$3,535,000
Stratton's Independence	78,000	2,600,000
Elkton	20,000	1,200,000
Strong	28,000	980,000
Mary McKinney	24,000	960,000
Vindicator	17,000	725,000
Ajax	20,000	700,000
Golden Cycle	23,000	690,000
E. Paso Con	6,000	500,000
Gold King	14,000	496,000
Anaconda	8,900	340,000
Stratton's C. C. & M. D. Co	7,000	280,000
Free Coinage	5,000	250,000
Modoc	3,500	245,000
Isabella	6,000	210,090
Christmas	6,000	210,000
Joe Dandy	4,000	200,000
Independence Con	6,200	186,000
Midget	3,600	180,000
Acacia	3,500	175,000
Anchoria-Leland	3,380	168,962
Victor	4,500	135,000
Findley	2,500	100,000
Pointer	1,750	89,827
Lillie	1,875	75,000
Gold Coin		1,000,000
Consolidated Mines		750,000
Doctor-Jack Pot		700,000
Gold Dollar Con		190,000
New Zealand Con		100,000
Damon		65,000
Battle Mt. and Misc		15,000

The following report has been made by the various reduction works and samplers handling Cripple Creek ores during 1901:

	Tons.	Value.
Colo. & Standard, Colorado City	204,935	$5,794,200
Metallic Nat. & Union, Florence	80,000	1,904,000
Economic, Cripple Cr'k	40,000	1,225,000
Dorcas, Florence	21,310	538,020
El Paso, Florence	3,500	87,500
Metallic, Florence	80,500	1,637,500
Union, Florence	29,950	548,250
National, Florence	2,000	76,000
Totals	409,195	$11,311,070

The samplers handled ore as follows:

	Tons.	Value.
Cripple Creek O. S. Co.	125,000	$5,000,000
Taylor & Burton	60,000	2,700,000
Rio Grande S. Co	90,000	4,236,873
Eagle	54,000	2,084,669
Totals	329,000	$14,021,542

IDAHO.

BOISE COUNTY.

The old Lincoln mine at Pearl has been bought by C. D. Kennedy and J. T. Hodson for $50,000. This mine has already made a record as a producer.

The Payette G. M. & M. Co. has been incorporated at Salt Lake City, Utah, capital $50,000. E. D. Woodruff is president and C. E. Hudson secretary and treasurer. The company owns the North Star, Buena Vista, Belle View and Bell Air claims in the West View district.

IDAHO COUNTY.

The Hidden Treasure and Rainbow groups at Thunder Mountain, each embracing three claims, have been sold by the locators to the Belle of Thunder Mountain M. Co., capital $1,000,000.

C. A. Jones, the discoverer of the Onyx mines near Orofino, has sold them to a Moline, Ill., company, and Mr. Jones says that several of the heavier stockholders of the company expect to visit the property the first of the year, when the work of development will be commenced.

The Gold Creek M. Co.'s claims on Snake river, 30 miles from Oro Fino, comprise 4 miles of Gold and Snake creek locations; 3 miles of flume, 4x5 feet in size, has been built, and a long stretch of 22-inch pipe installed. Operations with this company will start with the opening of spring.

SHOSHONE COUNTY.

L. O'Neill of Murray says of mining development in the vicinity of Murray that B. N. Hillard, manager of the Cœur d'Alene M. Co., owning placer grounds in Murray, is taking in his machinery over the snow. The Golden Chest, a quartz property, is working forty men and taking out gold.

MONTANA.

BEAVERHEAD COUNTY.

The first returns from ore shipped from the Ajax mine, in the Big Hole basin—a carload—netted $886.60. The ore carries galena and gold. This mine is owned by J. E. Morse and A. J. Noyes, and it is said that it is growing richer and wider as development progresses. The ore is freighted nearly 80 miles in order to get it to the shipping point at Divide.

The Hecla mines during 1901 shipped several hundred carloads of ore, which

camo from the Cleve and other properties. The group owned hy the Hecla Con. M. & M. Co. has yielded since discovery over $16,000,000 in ore values and paid nearly $3,000,000 dividends. The mines are still producing. H. Knippenberg is president and G. B. Conway is manager.

CHOTEAU COUNTY.

The Mission Peak Co., Putnam & Zortman and Finch & Campbell of Spokane, Wash., are doing a great deal of development work at Landusky. Finch & Campbell have honded the August and Little Ben mines from the Thomas O'Hanlon Co. of Chinook, and, it is reported, expect to take it up. They are also doing development on the Hawkeye, owned by A. D. Gill and W. Blackwell.

FLATHEAD COUNTY.

H. Hildebrandt has returned from Spokane, Wash., whore he went with orders for the purpose of forming a company to operate some of his mining property. The Mustang Con. M. Co., capital $300,000, has been incorporated at Spokane, Wash. A. A. Miller, A. D. Miller, G. F. Shawler of Spokane, Wash, and H. Hildebrandt of Libby are the officers and directors of the company, which owns the Mustang, Gold Pan, Gold Plate and Blue Jay claims in the West Fisher district. The development consists of a 60-foot tunnel, showing a vein 4 feet wide with a 10-inch pay streak. It is the intention to continue this tunnel and also commence another one lower down. The values are free milling.

GALLATIN COUNTY.

The Eriega Copper & Coal M. & S. Co. has been incorporated in Bozeman, capital $5,000,000, to operate in Madison and Gallatin counties. J. F. Firsch, C. L. Anceney, J. A. Fennell, A. Lewinski, S. H. Swetland, all of Bozeman, are among the stockholders.

JEFFERSON COUNTY.

The new mill erected hy J. H. Longmaid at the Elkhorn mine at Elkhorn, which, it is said, has cost upwards of $125,000, is now treating the ore from the dumps. In the meantime the hoilers and pumps have been installed and the work of unwatering the mine commenced. Upwards of 100 men are employed.

LEWIS AND CLARKE COUNTY.

Gold ore assaying very high has been discovered in the northern portion of this county. Numerous assays of ore from the discovery claim show from two to three ounces in gold and from 200 to 300 ounces in silver to the ton. The claim is located in the high mountains, and at this time of year is inaccessible.

MADISON COUNTY.

A. G. McDonald has taken a ten years' lease and bond on the Columbus group of four claims on Richmond Flat. It is estimated that development work in the last six months has exposed to sight several hundred thousands of dollars in ore values. Mr. McDonald is associated with Eastern people who will build a mill on the property next spring.

H. Ptomy has struck a body of $100 ore in the Lucas Flat at Summit.

J. H. Levy, who has been working the High Bluff mine at Meadow creek, shut down last week for the winter. He has been doing development work on a veln of high-grade ore from 4 to 18 inches wide.

C. L. Dahler of Iron Rod says he has succeeded in profitahly working over the tailings of the Iron Rod quartz mill by the cyanide process. He states that there is considerahle actlvity in mining at Iron Rod and that leasers on some of the mines are doing well.

The hond on the Comet mine, near Sheridan, has heen taken up by the Wall Street M. Co. through W. H. Godfrey of Great Falls. The property was formerly owned hy D. Keneally, P. Balsom and T. Reardon.

PARK COUNTY.

The Golden Gulch M. Co. has been incorporated at Livingston, capital $100,000. The president is C. F. Stickney of Philadelphia, Pa., and the manager W. Carr of Livingston. The company will operate placer claims in the Six Mile district.

SILVER BOW COUNTY.

J. Cummings, who is working the Edlth May, at Butte, under a lease and hond, says he has struck a body of ore about 15 feet from the surface that will assay 20% copper and a falr value in silver. The mine is owned hy G. H. Casey, P. J. Brophy and others of Butte.

Close estimates of the value of the hase and precious metals produced hy the Butte mines in 1901 aggregate $48,160,000. The output of some of the companies in pounds of copper is: Anaconda and Parrot companies, 125,000,000; Boston & Montana, ten months, 55,000,000; Montana Ore Purchasing Co., 25,000,000; W. A. Clark Co., 20,000,000; Butte & Boston, 14,000,000; Colorado Co., 12,000,000. The gold and silver product is valued at about three millions.

NEVADA.

ESMERALDA COUNTY.

The Willard & McDonald mine, near Holbrook, has been honded to S. G. Lines, who has men at work cleaning out the old shafts and tunnels and preparing for a search for the lost lead, which paid largely years since. O. C. Sawyer is Supt.

HUMBOLDT COUNTY.

The Sheha G. & S. M. Co., of Salt Lake City, have decided to start development work on the thirteen claims owned hy the company in Star district. Among the claims owned is the Old Sheba mine, from which $4,000,000 worth of ore has been taken. It was worked down to the water level and then abandoned.

LANDER COUNTY.

J. Johnston, W. M. Bradley and V. H. Pease have sold the Iron mine's group of claims, near Battle mountain, to ex-Senator Pettigrew, A. E. Hyde and J. W. Fox, Jr., of Salt Lake City, for $75,000, the first payment being $20,000. Fifteen men are now employed, and four of them working on ore are reported to have taken out over 400 tons of $40 free-milling rock since the 7th of December. It is the intention of the huyers to equlp the property with a mill as soon as possible. One chute of ore has been developed hy winzes 90 feet apart—one to a depth of 75 feet and the other 50, and the entire mass of 16 feet of ore, it is claimed, samples better than $21 per ton.

NYE COUNTY.

F. Golden, one of the Tonopah leasers, says there are now 45,000 tons of ore on the dumps which will run from $60 to $600 per ton, or a total of prohably $6,000,000. A million dollars worth has already heen shipped. Mr. Golden says that the leasers will put up a mill on the ground and work this ore themselves. It is practically free milling.

Sinclair & Golden were compelled to cease work in their shaft at Tonopah at a depth 208 feet on a pay streak 4 feet wide that averaged $320 a ton. Their lease expiring January 1, they had to extract ore nearer the surface that is as rich.

WASHOE COUNTY.

W. C. Williams of Olinghouse while running a tunnel to strike a ledge on which he had been working in the surface, struck a blind lead which he thinks is hetween 30 and 40 feet wide and says it will go $15 a ton.

The Slip Co. at Olinghouse has milled 25 tons of ore from the 165-foot level, taking the entire vein, and the returns show $12 per ton value.

NEW MEXICO.

DONA ANA COUNTY.

The Copper Bar Co. at Organ, owning a group of eight claims, C. R. Anthony, Supt., is sinking a double-compartment shaft on the Torpedo No. 2. A hoist huilding has heen erected and the work of sinking is being done hy power drills.

GRANT COUNTY.

The Mineral Mountain M. Co. of Stein's Pass has bought from W. Morris the Beck mine at Kimball.

Marsalls & Wood of Lordsburg have sold the San Simon group of mines in the Virginia district to the Gibson Dev. Co. of Providence, R. I. The properties show hodies of high-grade copper and lead ores running well in gold and silver.

SANTA FE COUNTY.

The Consolidated M. & S. Co., owners of the Cerrillos smelter at Cerrillos, are contemplating the construction of an electric tramway to the Tom Paine mine and other properties in the same vicinity. These are old silver workings bought hy the company. The properties will be worked for silver and lead. It is helieved that the smelter will be blown in ahout the middle of January.

The Gibson Dev. Co. is working on the Erie and Buck Eye mines near Cerrillos. At the 70-foot level in crosscutting ore running on an average of 20 ounces of silver and from 35% to 40% lead has heen struck.

SIERRA COUNTY.

The Monument M. & M. Co. has heen incorporated hy S. Phillips, J. H. Schmitz and M. Baroch, capital $100,000, with office at Chloride.

SOCORRO COUNTY.

J. Kerr & Son have been awarded a 550-foot tunnel contract on the Little Charlie group at Mogollon by the Mogollon G. & C. Co. The contractors expect to make 90 feet a month. Four lodes will he cut hefore reaching the main vein on which a shaft is heing sunk to connect with the tunnel.

OREGON.

BAKER COUNTY.

The Excelsior M. Co. has made arrangements for a deep plant to sink 400 feet on their mine, near Sumpter.

Supt. Arthur of the California mine at Cable Cove has made a shipment of ore to the smelter, consisting of four cars, assaying from $25 to $330 per ton. An average assay of the 80 tons will closely approach $85 per ton. Transportation charges from the mine and smelter charges aggregate $20 per ton.

GRANT COUNTY.

W. Miller, E. H. Test and N. U. Carpenter of Ontario and M. M. Shillock of Portland own the Paragon group of claims near Granite, and have done development work to the extent of an 80-foot tunnel on the ledge, which shows a well-defined vein of ore carrying good values

E. D. Steincamp and G. Barrett of Granite have sold the Big Four group of mining claims at Granite to W. C. Rutter of Seattle, representing Pennsylvania people. Mr. Rutter has ordered a wagon road built from the main road to the mine. It is the intention of the company to do some development work on the property next spring.

JACKSON COUNTY.

The Pearl M. Co., which is composed of Central Point and Jacksonville people, has its mill installed and has commenced crushing. Elk creek is a tributary of Rogue river, 45 miles from Jacksonville, and the quartz deposits which the district contains were supposed to be barren until some one had assays made of samples of the ore, when it was found to contain gold in paying quantities.

JOSEPHINE COUNTY.

In the Illinois River district all of the hydraulic mines now have a full pipe head of water and are running night and day. The Oak Flat hydraulic mines are being completely overhauled and re-equipped with new piping, new giants, deeper and wider ditches, and a new plant. The Wilson-Meredith hydraulic mines of the Illinois are running two 5 inch giants with a 350-foot pressure. A grizzly hydraulic elevator is operated in these mines to overcome a deficiency of natural dump.

UMATILLA COUNTY.

A large flume is projected on the north fork of the John Day, near Ukiah. The flume will be 7 miles long, estimated to cost $7000 a mile. It will require 1,000,000 feet of lumher to build it and will he used to take water to placer grounds which will be worked by hydraulic elevators. A sawmill is heing erected to cut the lumber for the flume. A newly formed company from Sidney, Ohio, will do the developing. The placer beds are from 2 to 4 miles long and average 150 or 200 feet in width. They are said to be very rich.

UTAH.

The total valuation of Utah's mineral output for 1901 was $19,070,737, divided as follows: Gold, $3,945,303; silver, $6,945,922; copper, $4,227,551; lead, $3,951,960. The output for the past year shows an increase in valuation of over $1,668,305 over 1900.

BEAVER COUNTY.

The Milford G. & C. Co. has been incorporated in Salt Lake City, capital $300,000; L. L. Downing is president and C. Opelt, secretary. The company owns the Big Traction, Idaho and Mark Hanna claims in the Star district.

The Orphan Boy M. Co. has heen incorporated at Salt Lake City, capital $30,000. W. D. Williams is president and C. A. Doe secretary and treasurer. The company owns the Orphan Boy, Orphan Boy Nos. 1 and 2, El Dorado and Little Eva Williams in Star district.

BOX ELDER COUNTY.

The Iris Con. M. Co. has been incorporated in Salt Lake City, capital $100,000; C. C. Dey is president and A. J. Lowe, secretary. The company owns the Iris, the Iris Nos. 2 and 3, the Zephyr, Zephyr Nos. 2 and 3, Accident and Snow Storm claims in Box Elder county.

The Hardanger G. M. & M. Co. has been incorporated at Salt Lake City, capital $30,000. R. B. Hamilton is president and M. S. Lindsay secretary. The company owns the Golden Fleece, Tom Boy, Valley Queen, Silent Friend and Belle of the West claims, near Black Hills canyon.

JUAB COUNTY.

The management of the Yankee Cons., at Tintic, have decided to discontinue the extraction of ore and to decrease the force to ahout thirty-men on development work. It is said to be the intention of Franklin sydicate, which owns the hulk of the stock, to erect a smelter for the treatment of Yankee ores in conjunction with the output of their copper mines in Beaver county.

SALT LAKE COUNTY.

Work will be started this month on the Legislator claim of Forman & West, near Bingham. Close to surface the vein is showing 12 inches of lead carbonate ore of shipping quality.

SUMMIT COUNTY.

For the year 1900 the mines of Park City paid in dividends $1,577,500, out of a total dividend hy all the mines of Utah of $2,437,500. In 1901 the Park City mines paid in dividends $2,621,500, an increase over 1900 of $1,044,000, as follows:

Silver King	$1,275,000
Daly-West	547,500
Quincy	725,000
Ontario	74,000
Total	$2.621,500
All other mines of Utah	1,924,000
Total for Utah	$4,545,500

Of the total dividends of Utah mines to date, amounting to $44,200,900, the mines of Park City have paid $23,547,500, as follows:

Ontario	$13,737,500
Silver King	4,725,000
Daly	2,925,000
Daly-West	1,155,000
Quincy	725,000
Crescent	280,000
Total	$23,547,500

The ore shipments from Park City mines in 1900 totaled 146,001,370 pounds, as follows:

Silver King	67,156,580
Daly-West	50,712,805
Anchor	14,742,480
Apex	1,263,110
Valeo	588,990
Crescent	38,360

The total shipments in 1901 were over 267,000,000 pounds, as follows:

Silver King	69,806,010
Daly-West	71,245,000
Ontario	45,655,000
Quincy	40,549,000
Anchor concentrates	18,862,780
California	2,087,900
Daly	1,928,000
Barnes Bros., concentrates	394,000
Loring Bros	1,618,000
Clark, concentrates	105,000
Mayne & Leonard	184,000
Valeo (estimated)	15,000,000
Total	267,434,690
Total for 1900	146,001,370
Increase in 1901	121,433,320

The Shields M. Co. of Park City has heen incorporated, capital $37,500; H. Shields is president and E. P. Evans, secretary. The company owns the Shields, Brant and Bates claims at Park City.

TOOELE COUNTY.

C. I. Rader, manager of the Annie Laurie mine at Gold Mountain, states that the vein for which work had been directed in tunnels Nos. 3 and 4 has heen struck and that assays have shown $148 in gold from tunnel No. 3 at a depth of 460 feet, and $77 from tunnel No. 4 at a depth of 560 feet. It is expected to handle 6000 tons of ore a month at the mine.

WASHINGTON.

FERRY COUNTY.

The Trade Dollar mine at Republic is producing high-grade ore in hoth north and south drifts on the 299-foot level. Gold is visible in most of the ore.

Rapid progress is heing made in drlving the tunnel on the Golden Lion-Little Four at Republic. C. T. Porter is Supt.

The Butte & Boston at Republic is now raising to drain the water from the old shaft. The ore opened up the past two months is of a better grade than that encountered before, and it is estimated will pay a good profit after treatment and transportation charges are paid.

SNOHOMISH COUNTY.

The placer gold strike near Oso has caused a rush for the new field. A nugget weighing one ounce has heen found. Many nuggets are said to be as large as peas.

STEVENS COUNTY.

The Great Western Marble Co. has been incorporated, capital $600,000; P. S. Byrne is president and J. N. Jones secretary, with office at Spokane. The company has deposits of red, pink and hrown marhle near Chewelah.

Active operations are to he commenced on the marble claims owned hy the Inland Empire Marble, Brick & Lime Co., near Northport. The company has ordered a $3000 drill plant, which will include two rock drills, a quarry bar for getting out slahs, a 60 H. P. boiler and engine, rubhing heds, polishing tahles and all the other equipment needed to start work in a thorough manner. J. M. Nelson is Supt.

WYOMING.

CARBON COUNTY.

The Columhia mine, near Saratoga, has driven an 869-foot tunnel. There are also two shafts on the property, each 40 feet in depth and in ore. The property is shipping.

The Michigan copper mine, near Encampment, is reported to have nickel in

paying quantities. The tests of the Michigan ore show as follows: Copper 11%, nickel 6.84%, gold $5 per ton. The shaft is now down 100 feet and is in ore all the way. W. Weber is Supt.

FOREIGN.

BRITISH COLUMBIA.

The Mines Exchange, Ltd., of Nelson, says: The final payment of $4000 for the Blue Jay placer property on Smith creek, in Lardeau, has been made by the Duquesne M. Co.——The third payment of $1000 on the American mine has been made by the Mountain M. Co. and the remaining payments tendered. The mine is said to be looking very good.——About 3000 tons of high-grade ore will be sledded from the Nettie L. this winter to Trout lake, to remain there till the completion of the A. & K. Ry. in the spring.

Development work at the Last Chance mine is going ahead with sixty men employed. The long tunnel is now in about 2000 feet. Sufficient ore is being shipped from the Last Chance to pay operating expenses.——The Silver Cup mine has let a contract for the hauling of 800 tons of ore.

At the Sunset group in the Deadwood Camp preparations have been made to ship ore. H. Johns, Supt., claims a half million tons in sight in the mine, which will average from $16 to $20 to the ton. Over two miles of development work has been done. The ore is sulphide, values being chiefly in gold.

A strike of 10 feet of ore averaging $26 to the ton in gold has been made on the Union Jack group at Ymir. The property has been bonded to the Active G. M. Co. of Cincinnati.

It is stated the Athahasca mine is to be reorganized and that an early resumption of work is probable.

The fire which consumed the bunk house at the Silver King mine has suspended operations at the mine and will cause the smelter to close down as soon as a week's ore supply is treated. The direct loss to the company is said to be about $25,000.

A rich strike has been made in the Slocan dry ore belt on the Ottowa claim, an ore body 8 inches wide, assaying 3185 ounces silver to the ton, having been found. The ore hitherto found on this property has been of rather low grade, running from twenty-nine to eighty-five ounces silver to the ton.

Nelson, Dec. 21.

The Velvet mine says it will apply to the next session of the House of Commons for a charter to construct a railroad to operate by steam or electricity from Rossland to the mine, and thence to the Red Mountain railroad, in all a distance of 30 miles. The idea is to provide for the transportation of ore and supplies and to develop the resources of the Sophie mountain district, now handicapped by cost of transportation.

The following are the ore shipments made for 1901 up to date from the Lardeau.

	Pounds.	Gross Value.
Silver Cup	2,400,000	$180,000 00
Nettie L.	2,340,000	146,250 00
Triune	649,776	82,870 27
Cromwell	23,289	1,296 79
St. Elmo	12,000	510 00
Ethel	34,000	1,596 00
Broadview	52,000	1,664 00
Great Northern	56,000	1,344 00
Lade Group	12,000	1,320 00
Beatrice	442,000	32,239 39
Ruffled Grouse	11,770	507 19
Linson View	868	63 17
	6,232,703	$449,660 81

It is reported at Nelson that the U. S. smelters propose to make reductions in freight and treatment charges from $3 to $4 per ton on B. C. silver-lead ores during the coming year. This, it is considered, will partly offset the reduced price in lead and enable most of the mines to continue operations during the year 1902.

T. B. Stewart of Glasgow, Scotland, the representative of the Scotch syndicate that is to erect a lead refining works at Kaslo, is having plans of the site and surrounding properties prepared. The works as laid out are to consist of two lead stacks each, with a daily capacity of 100 tons of lead ore. The refining works will be on a scale sufficient to handle all lead offering for refining and are to be so arranged that the capacity will be governed by the amount available. The plant is also to have a smoke condensing works of sufficient capacity to consume all the gases and smoke from the smelter and roasting works. The whole of the works are expected, when fully completed, to occupy the greater part of the twenty-acre site upon which they are to be located. Mr. Stewart expects to have the preliminary arrangements completed by Feb. 1, 1902, when he returns to Glasgow to confer with his principals.

Commercial Paragraphs.

THE Marion Steam Shovel Co. of Marion, Ohio, has completed a large boiler shop and will build its own boilers in 1902.

THE contract for the machinery for the copper smelting and concentrating plant, to be built at once by the Calumet & Arizona Mining Co. at Douglas, Ariz., has been awarded to Allis-Chalmers Co.

THE business of the Sullivan Machinery Co. in the Southwest and Mexico has assumed such proportions that they have deemed it expedient to establish a branch office and supply depot at El Paso, Texas.

THE Keystone Driller Co. of Beaver Falls, Pa., has completed two buildings each 40x200 feet. The machinery for the manufacture of portable drilling machines has been installed and operations in the new buildings begun.

THE Compressed Air Machinery Co., San Francisco, Cal., has removed to the new and commodious building, Nos. 24 and 26 First St., where new and improved machine tools have been added to the department devoted to the manufacture of Giant rock drills and air compressors.

THE new plant of the F. M. Davis Iron Works of Denver, Colo., one of the largest manufacturers of mining and milling machinery between Chicago and San Francisco, is completed. About two years ago this company had a most disastrous fire, completely destroying their old works. The plant as now rebuilt is modern in every respect, covering an area of about four acres, with a total floor space of over 70,000 square feet. The different departments are well equipped with the most modern machine tools, driven by electric motors and commanded by electric and pneumatic cranes. At present the company employs about 300 men, with a yearly output of over half a million dollars. Their product is exclusively machinery for the mining, milling and smelting of ores.

UNDER date of Dec. 20, 1901, the International Acheson Graphite Co. of Niagara Falls, N. Y., write: "We take pleasure in sending you, under separate cover, a pencil made from Acheson graphite manufactured in the electric furnace. Few people realize fully the achievement which is represented by this statement. The pencil we are sending symholizes the successful duplication by art of one of nature's processes. Since the fifteenth or sixteenth century pencils have been made from the natural mined product—graphite. This was in fact the first purpose for which graphite was used, the name itself being derived from the Greek word meaning "to write." Not all natural graphites, however, are suitable for the manufacture of pencils. None but the most uniform, purest and highest grades can be used. That Acheson graphite can be utilized for the manufacture of lead pencils is a guarantee as to its purity and superior qualities."

THE "Village Blacksmith" is probably one of the most beautiful poems ever published. Its charming sentiment, like England's morning and evening drum beats, challenges admiration and respect around the world. Yet, while standing in awe of the "strong right arm" of the famous smith, how feeble is the blow he strikes compared with that of a modern steam hammer, which can strike a 500-ton blow! The statement is made that several such hammers are in constant use in the steel works of Messrs. Geo. W. Pennington's Sons in San Francisco, Cal. The village blacksmith may have proudly exhibited a forging of his handiwork weighing possibly 100 pounds, while Messrs. Pennington's Sons say they turn out "single forgeings weighing 30,000 pounds and over" and that "the muffled music arising from the never-ceasing stamp, stamp, stamp of the Pennington hammered steel shoes and dies in thousands of quartz mills easily encircles the globe."

THE year which has just closed has evidently been a prosperous one for the Crocker-Wheeler Co. of Ampere, New Jersey. They report a record-breaking midwinter business, and find it difficult to keep the production up to the demand. The following are some of the recent shipments: Two 400 K. W. generators to the Vandergrift Construction Co.; one 300 K. W. generator to Stetson & Co. of Philadelphia, Pa.; one 150 K. W. generator to the D'Olier Engineering Co. of West Camp, N. Y.; one 40 K. W. generator and twenty-eight motors to the Smith-Brooks Publishing Co. plant in Denver, Colo. The United States Tube Co. of Buffalo, N. Y., has been supplied with a motor equipment, and the electrical equipment of the Con. P. Curran printing establishment in St. Louis, Mo., which takes the place of line shafting, has been completed. Orders for a large number of motors have been received from Armour & Co., The American Bridge Co. and The Marion Steam Shovel Co. An order for a 30 K. W. special generator has been received from H. H. The Sultan of Linga. The machine is to be installed in the Royal Palace, which is on an island near Singapore.

Personal.

F. W. M. DRAPER is now manager Waldo copper mines, Waldo, Or.

E. M. EYRE has returned from San Francisco to Phillipsburg, Mont.

R. RESTANO has resigned as Supt. of the Golden West mine at Sonora, Cal.

W. MCCORNICK JR. of Salt Lake City, Utah, is sojourning in San Francisco, Cal.

W. J. KEATING has been appointed Supt. of the Keating mines near Clifton, Ariz.

CHAS. F. BRANT of the Yellow Aster mine, Randsburg, Cal., is in San Francisco.

DANA HARMON, late Supt. Gaston Ridge, Cal., mine, has gone East on a business trip.

W. H. WASHBURN is now manager of the mill of the Hoosier Boy G, M. Co., at John Day, Or.

ROBERT SCHORR is expected to return to Kennet, Cal., from Bielitz, Austria, about March 1st.

LEWIS T. WRIGHT, manager of the Mountain Copper Co. at Keswick, Cal., is in San Francisco, Cal.

HON. W. C. RALSTON has returned from San Francisco to the Melones mine, Calaveras county, Cal.

E. C. ENGELHARDT has left Denver, Colo., for Arizona, for an indefinite time, on professional business.

JESSE J. MACDONALD of cyanide fame is in Denver, Colo., whither he recently returned from Montana.

R. J. CORY, manager Allis-Chalmers Co.'s Denver office, has returned to Denver from Mexico and Arizona.

F. O. CORTMARSH, foreman of the Fannie Marie G. M. & M. Co. at Glencoe, Cal., is sojourning in Boston, Mass.

W. T. BURNS, manager of the Roanoke mine at Cripple Creek, Colo., has returned to that place from Boston, Mass.

A. B. KNIGHT has been elected to fill the Charles W. Clark Chair of Mining at the State School of Mines, Butte, Mont.

J. B. WHITE, for many years making his headquarters at San Francisco, Cal., has removed to Salt Lake City, Utah.

GEO. J. ROCKWELL, metallurgist of the Allis-Chalmers Co., has returned to Chicago from a professional trip to Arizona.

J. H. SANBORN, representing the J. George Leyner Drill Co., Denver, Colo., is now traveling through Nevada and California.

JNO. GILLIE of Butte, Mont., has been appointed Supt. of all the mines of the Amalgamated Copper Co., a new position just created.

D. MINIHAN, late of the Rio Tinto mine in Spain, is now manager of the Refugio and Belen mines at Jesus Maria, Chihuahua, Mexico.

G. D. CASE of Copper Hill, Tenn., has been appointed general superintendent of the new Amalgamated Co. copper smelting plant at Anaconda.

WM. THOMPSON of London, England, is in British Columbia, arranging for the construction of a smelter at the Tyee copper mine, near Victoria.

C. A. HOLLAND has resigned as Supt. of the Providence mine, near Carters, Cal., and has been succeeded by A. Scott, who has been in charge of the mill.

A. M. JOHNSON, manager of the Clyde gold mine at Cripple Creek, Colo., has been appointed manager of the Ophir mine at State Line, Utah, and of the Tiewaukee mine at Bingham, Utah.

T. L. ODDIE, the treasurer of the old Tonopah M. Co. of Tonopah, Nev., has been elected manager of the new Tonopah M. Co., vice J. H. Jenkins, resigned. F. Siehert, the manager of the old Tonopah & Salt Lake Co., has been appointed assistant manager.

Books Received.

"Velocity Diagrams, Their Construction and Their Uses," by Charles W. MacCord, professor of mechanical drawing in the Stevens Institute of Technology at Hoboken, N. J., 8 vo., 116 pages, 83 figures, is, the author states, an abstract of a series of lectures forming part of the course of instruction at the Stevens Institute. It will be of service and interest to students and workers in mechanical drafting and machine designing. Published by John Wiley & Sons, 43 East Nineteenth Street, New York. Price in cloth, $1.50.

Latest Market Reports.

SAN FRANCISCO, Jan. 2, 1902.

SILVER.—Per oz., Troy: London, 25¾d (standard ounce, 925 fine); New York, bar silver, 55¾c (1000 fine); San Francisco, 55¾c; Mexican dollars, 44¾c San Francisco, 43¾c New York.

COPPER.—New York: Lake, 1 to 3 casks, $13.40; carload lots, $13.00; Electrolytic, 1 to 3 casks, $13.00; carload lots, $12.87½; Casting, 1 to 3 casks, $12.60; carload lots, $12.50. San Francisco: $15.15. Mill copper plates, $17.15; bars, 26@20c. London: £49 per ton.

The restriction of the production of the Butte, Mont., mines continues. More significant than this, as showing the overstock of the market, is the large reduction made in the working force at the United Verde mine in Arizona.

LEAD.—New York, $4.00; Salt Lake City, $3.50; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, har 5¼c; pig, $4.75. London, £10 3s 9d per ton = 2.24 cents per lb.

The American S. & R. Co., which last spring refused to take British Columbia lead-silver ores, is now reported to be offering concessions in freight and treatment charges to get these ores it then refused to take. This is clearly a move to restrict the production of lead from mines in the United States. The lead from the British Columbia ores is exported and does not come on the United States market in competition with the lead the American S. & R. Co. has accumulated. All the smelter capacity given to foreign ores is just that much that is taken away from United States ores. The price of lead in the United States will have a tendency to remain firm to consumers under the operation of this policy. The lead producers gain little from this maintenance of price, however.

SPELTER. — New York, $4.20; St. Louis, $3.75; London, £16 2s 6d per ton =3.58½ cts. per lb; San Francisco, ton lots, 5c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lh. lots, 10c; 300 to 500 lbs., 11c; 100-lh. lots, 13@15c.

IRON.—Pittshurg, Bessemer pig, $16.00; gray forge, $15.00; San Francisco, har, 2.60c per lh., 2.65c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $27.50; open hearth billets, $26.50; San Francisco, bar, 7c to 12c per lh.

TIN. — New York, pig, $23.50; San Francisco, ton lots, 27c; 1000 lbs., 27½c; 500 lbs., 27¾c; 200 lbs., 27½c; less, 28c; har tin, ₱ lb, 32½c.

PLATINUM.—San Francisco, crude, $19 ₱ oz.; New York, $20.50 per Troy oz.

BISMUTH.—New York, ₱ lb., Suhnitrate, $1.50; San Francisco, $2.50 to $2.75 lt lots.

QUICKSILVER. — New York, $51.00 large lots; London, £8 17s 6d; San Francisco, local, $48.00 ₱ flask of 76½ lbs.; Export, $45.00

MAGNESIUM.—New York, $2.90 ₱ lb.; San Francisco, $3.75.

ZINC.—San Francisco, 5½c; slab, 5¾c; bar, 7c; zinc dust, N. Y., 6c.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 18c; San Francisco, Plumbers', 100-lb. lots, 15.25c.

PHOSPHORUS. — F. o. b. New York 50@60c ₱ lb.

FERRO-MANGANESE. — Pittsburg, 80%, domestic, $53.50, large lots.

TUNGSTEN.—New York, ₱ lb., 95c; San Francisco, $1.15.

POWDER.—F. o. h. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ₱ set; 14 oz., 40s., 9c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 30@31c ₱ lb.; carloads, 28@29c; in 10-lb. tins, 40c; sulphuric acid, in carhoys, 66% B, 2c ₱ lb.; soda ash, $1.90 ₱ 100 lbs.; hyposulphite of soda, 2¾@3o ₱ lb.; blue vitriol, 5¾@6¼c ₱ lb.; horax, concentrated, 7@8c ₱ lb.; chlorate of potash, 12@13c; roll sulphur, 6c; alum, $1.90@2.00; flour sulphur, French, 2½@ 2¾c; California refined, 1¾@2c; nitric acid, in carboys, 8c ₱ lb.; caustic soda, in drums, 3@4c ₱ lb.; Cal. s. soda, hhls., $1.00;

MINING AND SCIENTIFIC PRESS.

Whole No. 2164.—VOLUME LXXXIV. Number 2. SAN FRANCISCO, SATURDAY, JANUARY 11, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Gold Mining for 1902.

The fashion in mines for 1902 would seem to be gold. That is to say, the investing public who buy mines of some kind will this year buy gold mines. Copper and, in a less degree, silver, lead and zinc, have been public favorites for two years, but of late have proven fickle. To those who bought early and sold late—but not too late—these baser metal mines have been just as if they were the real gold mines to which they have now turned for more of fortune's favors. To the others, who bought late and sold not at all, copper, silver and lead are base metals indeed, since the mask of golden fortune in them is removed. They will not be footlight favorites again while present memories last, even though they are good, steady company for the real miners. Copper, silver and lead will pay well for the mining of them, even with the lower prices. They will not pay for the mining of as large quantities, nor will as many mines pay. The industry as a whole, however, is sure to advance under the stimulus of adversity. Better mines will be developed and a superior art of mining and metallurgy will be developed by the enforced economies.

Gold—the old time favorite, the many time favorite—is again enthroned in the eye of the public who mine as a diversion or as a speculation. Why it should not always be first favorite and the lasting fashion is one of the inexplicable things that only political economists claim to understand. Gold mining, despite its advancing years, still has the charm of mystery, and the mystery of adventure, to attract with. Its repute as being uncertain is just. Those who claim to know it best, and for whom there is no mystery in it, say it is easier to tell good gold mines from bad gold mines than to tell whether crops will fruit or fail. Certainly, when it is only to find the gold and enough of it, there is more certainty to gold mining than to the mining of the other metals, where, in addition to finding them and enough of them, is added the uncertainty as what they will exchange for measured in gold.

There is no competition in gold mining. There is, as there very properly should be, a never ending effort to improve its methods and extend their application. The success of one gold miner, or one set of gold miners, in doing this, does not mean a possible increment of loss to other gold miners. On the contrary, it means an added increment of gain to the others and a new gold field opened for other gold miners. Their incoming cannot make an overproduction, no matter how much more production they may make.

There has been at times a suggestion that the gold mines of the world would be gathered into one great combination or trust. The possibility need inspire no fears for lessened profit in the industry. Independence is possible with gold mining as it is possible with no other kind of metal mining. It is not necessary to make a market for the metal; it is not even necessary that it should be coined to be exchangeable. While a monopoly of gold is conceivable, it is not seriously conceivable as being effected through the mining of all the gold from the mines. The people who would make such a monopoly would get the gold after it is mined with less risk.

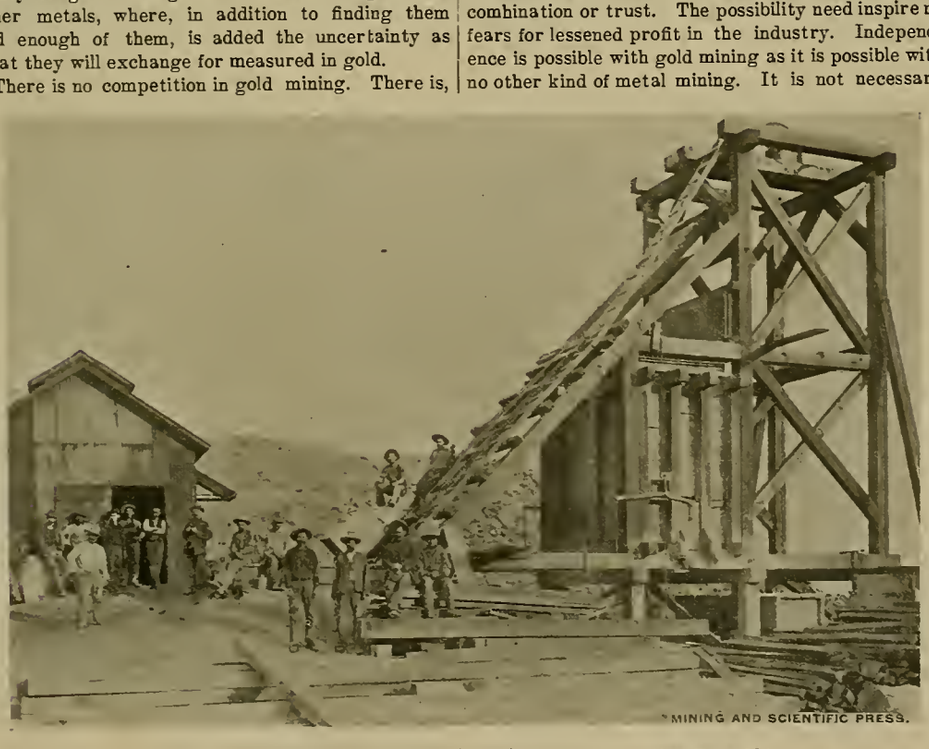
The year 1902 will be a good year to open new gold mines. The owners of old, long-closed gold mines, the owners of gold mine prospects, should bring them out onto the bargain counter while they are the fashion and while people who can buy will look at the yellow gold in the rock, and listen to and believe the mystery and romance of gold mining in distant lands. The fashion, while it should endure, past experience teaches will not last indefinitely. The days will come to it when the public think they know the mystery. They will ask too much of it, and, not getting it, will turn their money to other markets. So it is that now is the time for gold mines.

The prospectors can now bring their gold mines to the capital that a few years ago would not consider them. They should not fail to do it while the fashion lasts. There is no indication at the present time that any preference will be made as between lodes and placers. The possibilities of profit from both are now fully recognized.

It does not take as long a time to make a gold mine as it does to make a copper mine. The owners of the undeveloped gold mines have an advantage in this that has been denied to the owners of some copper mines. They are not as likely as the others to have undeveloped and unsold mines left when the fashion changes.

Most of what is gained in gold mining lasts. The new mines opened, if they pay, stay opened. A change of fashion in mines does not close them down. Not all the new gold mines that are opened prove good mines, but the continually advancing skill in the art is limiting the range of possible failure. It is easier to know in advance the chances, so as to take them if they seem to balance favorably, or to leave them, if the balance of chance is the other way.

Congress Concentrating Mills, Congress, Arizona.—(See Page 18.)



Shaft No. 6 on Niagara Vein, Congress Mine, Congress, Arizona.—(See Page 18.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union.....4 50

Entered at the S. F. Postoffice as second-class mail matter.

J. F. HALLORAN.....Publisher.

San Francisco, January 11, 1902.

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QUICKSILVER MINING is receiving increased attention in California. There has been no advance of price during the last year; but, on the other hand, there have been no fluctuations in price which could make investments in it uncertain. It is notable that old mines are not increasing production, even though considerable exploratory work has been done. The demand for the metal is increasing, and the extension of gold mining, which can be anticipated during the current and succeeding years, will still further increase the demand. It is recognized that the increase of production and the replacement of the diminishing yield of the present mines must come from new mines. These are being sought for in California, and capital seems disposed to interest itself in the industry. Old prospects that were turned down many years ago are being dug up again and re-examined. Some of the old mines closed down years ago, when quicksilver prices were much lower than at present, and when methods of extraction were wasteful and costly, are being reopened. With present prices remaining established, there are good profits to be obtained from the reopening of some of these old mines and the exploitation of some of the old prospects.

THE coal consumption of California for the year 1901 is estimated at 1,834,785 tons, as compared with 1,889,128 tons in 1900, 1,740,027 tons in 1899 and 1,832,273 tons in 1898. There has been an enormously increased consumption of fuel oil, but from figures of coal consumption it would appear that the oil has so far only held the coal consumption steady, and that the supply of oil is only keeping up with the gain in fuel consumption. When to the mechanical power represented by the fuel oil consumption is added the electrical power developed from new water power plants during the last two or three years, the sum total will exceed the energy represented by the coal consumption of 1901, which, as noted above, is very little different from the coal consumption of each of the three preceding years. It is a fair inference from the comparative figures of coal consumption on one side, and oil fuel consumption and electric power development from water on the other side, all of the latter being a development since 1898, that the manufacturing industries of California have in the aggregate doubled in the last four years. The rate of growth has been phenomenal if measured against the growth of the preceding years. It is notable that where in other places progress in industry is measured by increases in "coal consumption," here in California it is now written "fuel consumption," and with the increasing development of water powers it may soon come to be written "electrical consumption."

The Cost of Copper.

With the lowered sale price the cost of production of copper is receiving a great deal of attention, and much hastily gathered misinformation relating to it is appearing in print.

In the Lake Superior mines the cost of producing copper is inversely as the richness of the ore in metal. The ore in the mines is not uniform in its content. The general business policy followed at these mines while copper was at 17 cents a pound has been to mine out the lowest grade ores that would yield enough copper to pay a small profit. The cost of copper at many Michigan mines has, in following this policy, been from 14 to 16 cents a pound. Now that copper sells for only 12 cents, the policy at these mines will be to take out higher grade ores and thus reduce the cost per pound of their production below 12 cents. Not all of the mines will be able to do this, the quantity of sufficiently high grade ore being too small to permit of an economic production. That is to say, these mines cannot be worked to the capacity of their plant or proportionate to the investment they represent. The larger and older mines can adjust the grade of their ore output to the lowered sale price.

The Calumet & Hecla mine, when copper was selling three years ago and longer at 10 cents a pound, and less, was reducing 4½% ore—ninety pounds of copper to the ton. The cost of mining and reducing ore of this grade, aside from the refining, is no more than if the ore contained only 1% of copper. It is absolutely less costly now than five years ago to mine and mill these ores. The Calumet & Hecla produced copper at 4 cents or less per pound when copper was selling from 10 cents a pound down. If, as is claimed, it has been costing 9 cents a pound to produce copper when copper was selling at 17 cents, it is evident that the 4½% ore was left in reserve and ore grading about 2% copper has been mined. To maintain its profit margin against the lowered selling price, it will take the exceedingly simple way of mining richer ore.

The Calumet & Hecla will not be alone in this policy. In 1894 the Atlantic mine, with copper averaging a sale price of 9 cents a pound, made a profit from ore that yielded only seven-tenths of 1%, or fourteen pounds to the ton. The segregated costs of this production were per ton of ore: Mining, including breaking and sorting, $0.7518; rail transportation to mill (3 miles), $0.0303; stamping and separating, $0.2330; freight to New York, smelting, refining and marketing, $0.1771, making a total of $1.1922, or $0.08515 per pound of copper produced. The cost of production at this mine is now stated to be 12 cents, which would simply mean that one-half of 1% ore was being mined. It would seem quite safe to assume that there is to be no material reduction in the output of copper from the older of the Lake Superior mines, and not much, if any, reduction of profits earned by them.

In the Rocky Mountain and Pacific States copper mines the effect of the reduced sale price is not so readily compensated for by mining higher grade ores. For example, the Le Roi mine at Rossland, B. C., yields a grade of ore running close to 1.3% copper—26 pounds to the ton. The smelter pays for 70% of this, or 18.2 pounds. On this quantity a reduction of 5 cents a pound on the settling price means $0.91 a ton less return for the ore, and a third less net value in the ore reserves. The different character of the underground mining from that in the Lake Superior copper mines introduces physical difficulties which make it impracticable to increase the grade of ore mined without at the same time increasing the ton costs and reducing the life and total net output of the mines.

In mines where copper is a larger part of the total values, as compared with the gold and silver, the cost of production is a still more serious matter. At Butte, Mont., the gold per ton of ore is low—$0.70 to $1, the silver somewhat larger. But the gold and silver not aggregating anywhere near the ton cost of mining and reduction, this lower sale price of copper makes a much larger proportionate reduction in the total value of the metal production, and a larger cut into the profit margin under 17-cent copper. The mines of Butte are now being worked to depths at which, though the metal contents are more uniform, they are lower in quantity. A lower sale price of copper cannot be as certainly compensated for by mining a higher grade ore as was practicable when these mines were worked closer to the surface. The problem of adjusting costs to the new price conditions is certainly a serious and difficult problem, if anything like past production and earnings are to be maintained. Costs, which are stated to be from 10 to 12 cents a pound now for the production at all but a few of the mines (the Boston & Montana being stated at 7 cents), cannot be reduced much without reducing the output of metal and the life of the mine very materially.

In Arizona, Utah, Nevada and California the mines are much younger. They are, as a rule, working at depths and in deposits where nature has made a secondary concentration of the valuable metals. In many of them the gold content alone is in excess of ton costs. The silver content is often proportionally larger with straight pyritic copper ores than at Butte. There are definable lines between bodies of high and low grade ore, making it practicable to remove the one and leave the other. These conditions are all favorable and minimize the effect of the reduced price. It is possible to commercially compensate it by reducing costs without largely affecting the output. It is notable that the United Verde mine in Arizona is credited with producing copper at 3 cents a pound, the Utah Consolidated in Utah at 4 cents. To these mines and others like them the reduced price of copper means less profits, but does not involve changes in mining practice to reduce costs. They are much more independent of the price of copper than even the Lake Superior mines.

A Miners' Home.

Some months since this journal published a letter from Col. N. E. Linsley of Spokane, Wash., earnestly suggesting the establishing of a home for old prospectors. The claims of these old pioneers of mining on the consideration of those who have found fortune from mines were very convincingly stated in the communication, which at the time created some discussion.

Since then Mrs. Mary Judge of Salt Lake City, Utah, has endowed a home for aged and disabled miners in that State. The inspiration for Mrs. Judge's kindly act is understood to be the desire to perpetuate the memory of her deceased husband, whose fortune was accumulated from mining.

The example made of what a woman can do this journal hopes will be followed by others giving from their abundance the comparatively small sums required to maintain in comfort and security through their last years of life the old miners and prospectors of the West. They do not require pretentious and costly establishments, but such homes and surroundings as will be most like those they have been accustomed to. For these men such a place as Mrs. Judge's $10,000 will provide will perform a great deal of useful service. There is ample opportunity for more $10,000 establishments. One might very appropriately be located where Col. Linsley suggested, at Coloma, where John Marshall made the discovery of gold in California.

THE field for invention of mining and metallurgical apparatus and methods is this year essentially the field of utility provided by the necessities of small mines. There are many more small metal-bearing mines than there are large metal-bearing mines. There is no physical upper limit to the size of mining plants that can be constructed. Invention has of late been largely directed to making these large establishments more efficient economically. So long as the margin of profit was high these great mines had a commercial advantage over the smaller ones. With lower prices this supremacy in economy becomes questionable. If the great mines cannot run at full capacity their great works become for that time a cost burden on the output, which brings them closer to the little mines in economy. The latter now need the same economical development that the great mines have had. It is not desirable to make economies by reducing wages. It is desirable to make economies by increasing the per capita output of labor. Industry, as a whole, will be better for the change of economic conditions. It is for invention to provide the ways, now that the necessities of the small miners have created the means.

Concentrates.

A RUSSIAN "pood" of gold is $10,000.

THE average California loss of quicksilver is about one pound to every fifty tons of ore.

THE ore mined by the Mountain Copper Co., Keswick, Cal., carries from 4% to 6% copper.

TO FIND the resistance of an iron wire, multiply its length by 72 and divide by the circular mils area.

STEEL may be heated to any degree before redness, and it will remain after quenching as soft as before.

A STAMP dropping ninety times per minute, with a cam lift of 7 inches, will take just two-thirds of a second for lift and drop.

LIMESTONE is a "mineral" within the meaning of the United States mining law, and may be located and patented as a mining claim.

THE left hand side of a horizontal boiler is the side corresponding to the left hand of a person when standing in front of and facing the boiler.

THE Golden Fleece mine tunnel, near Lake City, Colo., is lighted by electricity, incandescent lamps being set 100 feet apart through its entire length.

THE duty of a mine owner as to ventilation of his mine and keeping it clear of standing gas is made imperative by the Act of Congress of March 3, 1891.

THE first gold mine in the United States is stated to have been the Barringer, Stanley county, N. C., a placer mine that later paid as a quartz claim.

MICA of clear sheets and good cleavage, 2 inches by 3 inches, is worth about 15 cents per pound; 2x4 inches, 13 cents; 4x6 inches, 55 cents; 5x8 inches, $1.25.

STEEL is now of occasional use in the "timbering" of shafts, posts being used made of steel angles riveted together, and supporting the lagging of 4-inch planks.

A MINING LOCATION made by agent without actually going on the claim to post the notice is legal. If signed by the locator, an agent can post it on the claim and witness the posting.

TO PRODUCE bullion having gold fineness of 500, 2.4548 ounces Troy bullion of 1000 gold fineness, or 3.0685 ounces Troy bullion of 900 gold fineness must be added to 32.3 ounces Troy of bullion 462 fine, gold.

IN a discharge line 2000 feet long through two 5-inch pipe lines would flow 11,180 gallons of water, while through one 7-inch pipe line would flow 12,965 gallons, allowing that in both cases there was the same head.

THERE are several large nuggets of platinum in existence, notably in Russian Government cabinets. Probably the largest is that owned by Baker & Co., the Newark, N. J., platinum refiners, which was illustrated in these columns some years ago.

A COMPRESSED AIR DRILL can be kept from freezing by use of the warm discharge water from the mine. A ¼-inch pipe attached to the exhaust ports of the drills and the warm water piped into them will keep them free from frost, though half a mile from the source of supply.

THE ore taken out in sinking a shaft has been known to pay the cost of sinking it as it progressed. It is claimed that from the Clark shaft on the Mizpah Lode at Tonopah, Nevada, the ore taken out in sinking returned $664 for each foot sunk to 200 feet depth. This was more than the sinking cost.

A CHIMNEY 120 feet high will burn twenty-one pounds of coal per hour for each square foot of grate. The chimney will furnish draft for 123 square feet of grate. While the force of the draft increases directly as the height of the chimney is increased, its capacity for burning coal increases only as the square root of the height.

IN the production of white lead by the electric arc gases are blown upon the lead while it is in a molten state in the presence of the arc. The fumes produced are blown over into chambers having cloth covers or roofs. The powdered white lead falls down and the unconsumed gases pass through the cloth, to be used again.

IN the acid open-hearth process of steel making the bottom of the furnace is made of refractory siliceous sand. In the basis process dolomite or magnesite, or a combination of both, is used, and during the process limestone is employed to unite with the silicon and form a basic slag. The character of the lining used gives to the process its name, as acid or basic.

GREASE in smallest quantities, or gum or resin from blocks or lining of sluices, is ruinous to mercury, causing it to flour. Distillation is of little use, as the substances mentioned pass over in retorting and condense again. Where other chemicals are not easily obtainable, washing the mercury in a strong solution of potash obtained by leaching wood ashes will purify it.

USUALLY the power required to run a jig or jigs is a matter determined by the area of the sieve, the height of the tailboard, the specific gravity of the material to be jigged, the length of stroke and number of strokes per minute, though there are even other factors in the problem. A 1-sieve jig should have at least 1½ H. P., a 3-sieve jig 2 H. P., and a 4-sieve jig 3 H. P.

IN heavily sulphuretted ore in Colorado, stamps have been in use as light as 550 pounds, having a 16-inch drop of about thirty to the minute. In California stamps weighing as much as 1400 pounds have been used, though the practice is not common, the stamps ordinarily being from 900 to 1000 pounds in weight, with a speed of ninety drops per minute, the height of drop being about 8 inches.

WHILE it is theoretically practical to utilize the waste heat from a roasting furnace in making steam, yet in practice it has usually been found that the pipes used in such generation ordinarily become so coated with flue dust in a short time as to prevent heat absorption and interfere greatly with steam production, though as a feed-water heater, attached to a boiler, considerable success has been attained.

THE best known antidote for cyanide poisoning is peroxide of hydrogen. It should be administered hypodermically, at intervals of two and one-half minutes, until the patient gives signs of returning consciousness. It is necessary that the antidote be administered at once; a delay of even two minutes might prove fatal, hence the peroxide and hypodermic syringe should be immediately accessible.

MINIUM is a natural mineral, oxide of lead, composition Pb_3O_4 or $2PbO\ PbO_2$. It occurs pulverent as fine crystalline scales. The color is a vivid red, sometimes mixed with yellow. It is noted as occurring at localities in Germany. There is no reason why it should not be found in Nevada. The specific gravity is 5, which would make it somewhat heavier than magnetic oxide of iron. The mineral is used as a base of some paints.

A QUARTZ LOCATION is legal even if as a fact the locator does not stake the end lines parallel. A subsequent locator can, however, come within the end lines with his location and by care in making his location seclure a valid claim to the ground that the first locator had erroneously included. A subsequent locator can not by his location get any right to the particular lode located by the first locator within the end lines of that locator, even if the end lines are not staked parallel.

IN the case of Strickley et al. vs. Hill, 62 Pac. Rep. (Utah), 893, the court held that if a citizen and an alien jointly locate a claim not exceeding the amount of ground allowed to one locator, such location is valid as to the citizen, or to one who has declared his intention to become such; and a conveyance by him, through an alien, to another citizen, conveys a complete title to the claim located, provided all other provisions of the law were complied with, and there be no intervening rights.

STEEL, iron and other metals grow "tired" and lose much of their strength and elasticity by long-continued subjection to quite moderate stress or vibrations. When allowed to rest for a time these metals recuperate and recover their pristine strength. This observation has been made so often, and has been so thoroughly proved by repeated laboratory tests, not only on a small scale, conducted with the greatest care and accuracy, but also upon a large scale, with full sized bridge members and other commercial forms of steel and iron, that it has become generally accepted by engineers as a positive and well-understood law.

A MINING CLAIM can not be located on land which has been patented, no matter what kind of a patent it is, unless it be a known lode at the time the United States Land Office receiver's certificate is issued showing payment by the applicant for the land. No lodes or minerals are subject to location except those that are on public land or are expressly reserved within grants. Extralateral rights are only acquired as an appurtenance to lode locations on public lands. Lodes discovered subsequent to the issuance of patents other than lode patents can have only such rights appurtenant as the owners of the land choose to grant.

IF eight persons make eight separate placer locations of twenty acres each, and seven of the locators convey their claims to the other, it requires annual assessment work of the value of $800 to maintain the possessory right to all the claims. In the case of a single location, embracing 160 acres of placer mining land, the locator to maintain his possessory right would not be required to expend $100 worth of mining labor on each twenty acres; his possessory right to the entire 160 acres might be maintained by performing thereon $100 of actual mining work, designed in good faith for the improvement of the 160-acre location as a single mining claim.

THE Government in reserving mineral in lands that it grants reserves only the mineral that is known at the date of the grant. The equity of title to land after patent by the United States rests with the State. The State can make laws affecting the title, provided no conflict is made with the general rights to property guaranteed by the Constitution of the United States. The State could make laws by which it could in effect give extralateral rights to mines in lands patented by the United States without such a reservation, but it would seem as if it could only do so for itself (the State), and would have to provide compensation to the owner of the patent.

THE spontaneous ignition in the gas engine is most likely brought about by hot metal, and probably occurs close to the regular point of ignition. Its trouble arises from the tendency to become earlier and earlier. By occurring considerably before the proper time, it checks the speed of the engine and increases the successive heating which is its cause. Scale or a failure of water in the jackets may bring it about; possibly the cocks controlling the division of the water between the cylinders may not be properly set, thus allowing one cylinder to get too hot, while the combined outgoing water has a reasonable temperature. Leaky exhaust valves or igniters become much overheated and are the chief cause of this trouble. They should be kept tight.

THE average price of lead in New York city during the administration of Harrison, 1888–92, was $55 08 per ton. Under Cleveland's last administration, 1892–96, it was $42 per ton. The American Smelting & Refining Co. controls the price of lead absolutely, and buys its lead ore from the miners upon the basis of New York prices from day to day. The company was organized in April, 1899. The price of lead in May was 4.42½ cents, in June 4.47½ cents, in July 4.52½ cents. For the rest of 1899 lead did not fall below 4.60 cents, and in December was 4.75 cents. It remained at 4.70 cents in 1900 until May 11th, when it fell to 4.42½ cents, the next week it declined to 4 cents, in June it fell to 3.81¼ cents and advanced to 4 25 cents in July. It has been reduced to 4.12½ cents, to 4 cents, and now to 3½ cents.

IF COPPER exists in an ore as a sulphide, cyanide will have little if any effect upon it, and so small an amount will be dissolved that the work of the cyanide in recovering the gold will not be interfered with. If the copper exists as a sulphate or carbonate it may be removed and saved, and if in sufficient quantity, quite profitably, prior to the application of the cyanide. The greatest difficulty with which cyaniders have had to contend has been the effects of the products of decomposition or oxidization of sulphurets, but they are gradually getting the mastery of even these. There is one difficulty, however, which floors the worker with any process, and that is the lack of values in the ore. Give most cyaniders ore containing reasonably good values in gold and silver, and plenty of it, and they will find a way to get the values out.

A PATENT to land obtained under the Desert Land Act makes exactly the same grant that a patent to agricultural land homestead or pre-emption makes. Most of the decisions construe the grant as absolute and carrying everything within the vertical planes of the boundary lines. One decision of a Nevada trial court says a mineral claimant can follow the dip of his vein under the agricultural land. This decision is up on appeal now. There is one form of the question which "Concentrates" believes has never been litigated. It is this: A tract of land is patented as agricultural land subsequent to it becoming known that a lode having its apex outside the boundaries dipped beneath the tract, would the patent to the agricultural land carry the vein of ore, or would it be excluded as a known vein? The latter would seem to be the reasonable view. The essence of the reservation made by the law would seem to be the mineral lode that was known to be in the ground, regardless of whether or not the mere superficial evidence of it was on the surface of the land or not. It would hardly seem to be material whether the lode was located or not before patent to the agricultural land issued if the lode was known to exist and known to dip into the agricultural land. It has been repeatedly ruled that the right of prescription does not run as against the Government.

WET PROCESS for treating copper ore in small quantities, known as Henderson's, is successfully used in the extraction of the 2% or 3% of copper contained in pyrites roasted at vitriol works for the sake of the sulphur therein. These residues contain a very small quantity of silver and a small proportion of residual sulphur. They are mixed with a sufficient quantity of common salt and heated in a muffle furnace to a very moderate red heat. A muffle furnace is heated externally so that the products of combustion from the fuel can not gain admission. Air is allowed free access to the mixture, and any fumes evolved are withdrawn by flues. The copper sulphide present becomes copper sulphate, and this reacts with the common salt, forming copper chloride and sodium sulphate, while the silver is simultaneously converted into silver chloride. On withdrawing the charge it is transferred to large vats fitted with false bottoms covered with brushwood to serve as a filter and there treated with water which dissolves the chloride of copper and the common salt, the brine thus produced dissolving the silver chloride also. The solution is then filtered off into a separate tank and treated by Claudet's process, which consists in mixing it with a solution of iodide of zinc containing just enough iodine to combine with all the silver present; silver iodide is thus produced, containing small quantities of gold and some lead, and, as it is insoluble in brine, it separates out in the solid state and sinks to the bottom. On filtering the liquid again, a solution of chloride of copper free from silver is obtained; and the solid iodide of silver, being carefully collected, is treated with metallic zinc, which decomposes it, reforming an iodide of zinc that may be dissolved in water and used to separate the silver from a fresh batch of ore, while the silver, now in the metallic state, is melted and refined. The working loss of iodine is made up by adding iodide of potassium. The solution of chloride of copper obtained in this way, or that of sulphate of copper recovered from ores that have undergone a sulphating wash, may be made to yield up the copper therein in a powdery but metallic form by the well-known process of placing fragments of scrap iron in the liquid in large tanks, or as it flows through long channels. The iron exchanges places with the copper, because its combining power for sulphuric or hydrochloric acid is greater than that of copper. It gradually dissolves into the solution, and a precipitate of copper separates in the form of cement copper, which is seldom sufficiently pure to be used direct, and is therefore subsequently refined in furnaces or electrolytically.

The Mind of the Engineer.

Written for the MINING AND SCIENTIFIC PRESS by CHARLES H. FITCH.

Two mining men of London have heen discussing what constitutes a mining engineer. One says that he should have "some" practice, uttering the usual and proper idea that a young man should sit awhile at the feet of Dame Theory, then leave the dame school and go out into the rough, adult world and apply what she has told him, finding that he has learned a great deal that is not so, or which he has not rightly understood. After he has taken a few falls, trying to check his theories with practice, he is no douht a wiser, more modest and a hetter man.

The other disputant contended that a mining engineer should not he a conglomerate of some theory and some practice, hut that practice alone should be the touchstone of his profession. Could he get down to husiness and "do" it? That is the question.

I agree with hoth of them, respect the academic, hut how most profoundly to the practical. In my business I keep several hunches of addresses of people upon cards. One hunch is laheled "Academic Interests." I am bound to admit that this suffers from inattention when compared with other hunches of cards relating to people with whom associations are enjoyed mainly on account of the "mammon of unrighteousness"—orders—and not on account of thirst for knowledge.

It is proverhial that shoemaker's children are illshod and that the physician is taunted to heal himself, and it is not surprising that scientific professions should have no very scientific method of testing the qualifications of their own memhers.

A practicing engineer is an active product, as a bridge truss is a static product of engineering science. It is not convenient to test a hridge to destruction to determine how good it is. Only samples of its material can he tested. George J. Bancroft has told us how to proceed in sampling a mine for its values; hut how shall we sample an engineer for his ahility? In a general way, by their works ye shall know them; hut we can rarely do more than take a sample of work and make a guess estimate for all the rest. As for education, there is something notahly unscientific and inadequate in the preparation which does not qualify for work, but leaves untouched great mental areas which will determine whether or not a man's studies are to he of any practical use. In spite of the brave distribution of millionaires' money, my ohservations at three richly endowed universities convince me that much of our education does not reach the working mind at all, and is of little more effect than striking the hody of a man with the outside of a hook. I reckon that there are men of much ahility and value who would fail flatly to pass again examinations in calculus and spherical geometry, which they passed with flying colors when they were juniors in "tech" and had no practical qualifications to speak of.

We look at the face of an applicant, and prefer to see it open and agreeahle, with an expression of quiet confidence and self-respect. We do not usually give him a "stunt" to do, hut inquire what he has done, and with whom he has heen. Then we take the chances with him or not.

In some cases long schedules are suhmitted to he filled out hy intending employees, and covering parentage, previous work and anything that would suggest itself in the way of precaution should crooked or weak places exist in the applicant's career. But some shrewd managers put little reliance on such methods. "Young man, put hack your letters and parchments into your pocket. Carry that face of yours down South and tell the people you love the country, keep your eyes open and sell engines." The spirit of gallantry and adventure gives point and progress to enterprises in engineering husiness. It would he an incredible blue-stocking who would look with favor on a suitor caught reading a hook on "How to Win a Woman." Books have their uses, hut it is a stupid fellow who accepts a hook as a suhstitute for a mind of his own. I shun despotic hooks as I do despotic people, and say to them: "Take your shadow off from me. Get out of my sunlight."

Let us see, then, what can he done. As a deacon, rising in meeting, asks his brethren to accompany him in prayer that his feehle petitions may be strengthened, I ask your readers to accompany me in thought on this important subject of the engineering man. Difference in men is difference in their thought.

If we had the gift of a mind reader and could range in comparison the mental processes of a capahle alongside those of an incapahle mind, we would find some interesting contracts which would henefit the art of technical education. Such a survey of the incapahle mind might show like a magnified section of cast metal—separated spots or crystals in a matrix of other matter; while the capahle mind might show like a magnified section of wrought metal, with its crystals fihrous, laced and interrelated. In other words, the material of incapahility, the primal stupidity which appalls us in our efforts to reform others, and must be acknowledged to occasionally crop out in ourselves, is the raw material which, subjected to a process of working, becomes rearranged and connected up, so that ideas do not each remain apart, crystallized, in its own cell, hut communicate one with another in the circuits called rational processes of thought—those stresses or impressions which they receive from outside.

Another hroad measure of analogy which I get from the nature of materials for the benefit of civil government, is that, as cast iron is chiefly good for compressive strains, and cannot he safely trusted in tension, so persons whose rational faculties are of a low instinctive order must be governed. The effort to redeem them from oppression on ideal sentimental grounds, hy erecting them into high structures of self-governmeut, is like huilding cast iron in edifices requiring the tensile strength of steel. The dream hreaks down in the test of realization. An American engineer, accustomed to deal with independent citizens, and going to take charge of foreign mines, may be puzzled to deal with the servility and duplicity of native laborers until he learns that he has to use minds which render good service only under compression.

Wrought iron and steel are dual in their resistance to stresses, withstanding hoth tension and compression. The rational mind is also dual in its systems of comparison and imagery. Two poised arms are required in the halance which is to weigh and consider. The rational mind is also dual in its moral aspect, coupling with every claim for a right an acknowledgment of a duty, and not heing, as most of us still are, very much stronger in claims of right than in assumptions of duty.

As all men are and have heen, in measure, hoth capahle and incapahle in different matters, we ought to he ahle to take an interior view of the suhject and draw some scientific deductions for our own benefit from the composition of our own minds. This suggestion, for which I claim a practicality as strong as anything in the specifications for material machinery, is analogous to the reactions of automatism in engines and in mill arrangements, and self-induction in the currents of motors. These principles do not make us ahsolutely independent. That is a fatal idea which turns us hack to stupidity and isolation. What they do is to build us up on two mutually supporting sides, larger influence with others and larger control of ourselves.

Congress Mine and Mills, Congress, Ariz.*

[STAFF CORRESPONDENCE.]

The new concentrating mill of the Congress Gold Co., Congress, Ariz., operates steadily on 150 tons daily of sulphide ores, making ahout fifteen tons a day of coucentrate that runs ahout 7% silica and over 40% iron. The hulk of the siliceous matter is taken out hy the Standard concentrators in use. The principal values, which are in gold, are carried in the iron hase. However, the ores include considerable amount of oxidized material, the values in which are recovered in the cyanide work. The tailings from the tables are all cyanided, those of the clean siliceous nature passing direct to the leaching tanks, the finer slimes containing oxides and sulphides heing first passed through a Brown roaster. The new mill has forty stamps, 1000 pounds each, dropping 100 to the minute, the screens being 20-mesh. The old mill, which has heen remodeled and provided with some new machinery, will be operating hy Jan. 1, 1902, and has forty stamps and eight vanners. Half of the concentrating floor will be used for a while in experimenting with various types of riffle tables. It is proposed by Manager W. F. Staunton to make some comparative tests.

The power plant of the new mill comprises a 12 and 24x36-inch compound condensing Corliss engine of the Allis type; a Rand air compressor, 14 and 22 and 19 and 12x30 inches. The condenser combines with a surface feed heater, the cooling of the circulating water in a Barnard fanless cooling tower. The plant includes four return tuhular hoilers, each 54 inches hy 16 feet, which work at 125 pounds steam pressure and are fed hy automatic stokers. This boiler plant will also supply power for the old mill.

The Congress mine has heen operated during the past twelve years, and the manager states there are greater ore reserves to-day than at any prior time. As has often heen noted, the main incline shaft on the Congress vein opens that ledge at 75-foot stations down to 3150 feet depth on the dip of 45°. Much of the recent production and development are on the Niagara vein, on which there are two shafts 3800 feet apart, reaching a depth on the dip of 1050 and 700 feet respectively. On this vein, as on the main Congress lead, the high-grade ore runs uniformly from the surface to present depth.

Congress, Dec. 24, 1901.

*See Illustrations on front page.

No. 2 Incline Shaft, Congress Mine, Congress, Arizona.

Man Power and Its Cost.

Rankine gives the following tahle for the power of a man doing different kinds of work:

	Hours Per Day.	Horse Power.
Raising his own weight up stair or ladder	8	.1320
Hauling up weights with rope, lowering it empty	6	.0545
Lifting weights by hand	6	.0440
Carrying weights up stairs, returning unloaded	6	.0337
Shoveling earth to height of 5 feet 6 inches	10	.0142
Pushing or pulling horizontally	8	.0965
Turning a crank or winch	8	.0820
Working a pump	10	.0600

Assuming .1 H. P. as the power of the average man, then, if lahor can he procured for $1 per day of ten hours, a horse power hour will cost $1; a horse power year, assuming 3000 hours per year, will cost $3000, which is greatly in excess of any other kind of power. Another disadvantage of human power is that it cannot he worked continuously, hut must have long periods for rest and recuperation. It also requires a large amount of space for a small amount of power as compared with other sources of power.

In "The Animal as a Machine," Dr. Thurston gives the thermo-dynamic efficiency of a man as 20%, which is about the same as that of the hest steam engine. In respect to weight per horse power, a man has $\frac{600}{700}$ pounds as compared with the $\frac{1500}{2000}$ pounds of the horse, or the $\frac{50}{100}$ pounds of the hird. Mr. Box gives the power of a man, working ten hours per day on a winch as .072 H. P., on a treadmill as .105 H. P., and on a capstan .084 H. P. If the hours of labor are reduced from ten to four per day, then in the ahove cases the power will he increased to .113, .167 and .134 H. P. respectively, thus showing the large increase of power as the time of lahor is shortened. D. K. Clark says that the average man working on a pump, winch or crane exerts ahout .1 H. P. if the day consists of ten hours, but that he can produce four or five times this amount if the time is shortened.

Solving the Fuel Problem in Arizona Mines.

Written for the MINING AND SCIENTIFIC PRESS by J. H. WOOD.

With the decline in copper values, the fuel problem assumes even greater importance than it already held as a factor in successful mining operations. When operating the Eobie Grande mines, south of Bishee, before the railroad was extended into Sonora, the coke item was a most serious one. Coke which was bought at the Colorado ovens for $3.50 cost us about $12 laid down at the railway terminal. Freighting charges from that point to the smelter—some 40 miles—ranged from $8 to $9.50 per ton, so that by the time the coke reached the smelter its cost had risen from $3.50 to $21 or more.

This almost prohibitive cost was not the only disadvantage in using coke. There were times when the manufacturers could not fill our orders, times when cars were delayed on the railway, times when freighting teams were scarce, as well as when they were stalled en route with several carloads of coke aboard.

Is it any wonder, then, that mine superintendents are ever hopeful of finding in oil an ideal fuel? Every experiment with this end in view is kept in mind and results carefully studied. Much advancement has been made in the use of oil as fuel in various parts of Arizona. At the Congress mine crude oil has been used for years in the roasters. At that mine the non-shipping ore is crushed, plated and concentrated. But as all the values cannot be extracted by this process the tailings are roasted in the oil fuel furnaces before cyaniding. In this operation the tailings are carried, in endless chain buckets, through a series of furnaces or fire boxes, in which the fire consists solely of burning oil.

Another important step forward has just been taken at Globe, Ariz., where the Old Dominion Copper Co., after a month's trial, announces that the experiment of using fuel oil in smelters has been successful. This test has demonstrated that oil is cheaper than wood or coal and can be used with entire satisfaction in smelting work. The use of oil as fuel is to be expanded at the Old Dominion plant so as to extend to the boilers at the mines. To carry out this plan the company will erect storage tanks of 200,000 gallons capacity, and construct a pipe line to convey oil from the smelter to the mines. Only those who have the practical management of Arizona mines on their hands can fully appreciate the difference in results which will follow the general introduction of oil as a cheaper substitute fuel for wood, coke and coal.

Reverting to the Congress mine, it should not be forgotten that the standard gauge steam railway engines in use on the Congress Railway, operating between Congress Junction and Congress, use crude oil as fuel under their boilers. In this case, too, the operation is eminently successful.

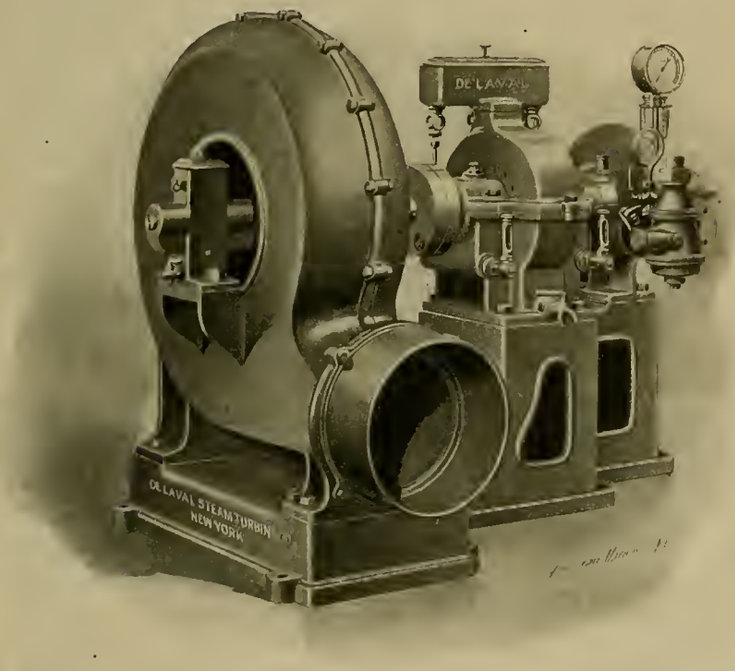
The experiments above cited involve only the use of crude oil, but other tests have been going on with better quality oil. One in particular was conducted with a view to ascertaining whether crude distillate could be used as the motive power in gas and gasoline engines, instead of either gas or high-grade gasoline, at the suggestion of an Arizona operator who found steam plants unsuitable for his operations. In order to make the test on a large and practical scale, a carload of 45° distillate was shipped from the Puente, Cal., refinery to the engine manufacturing company's factory.

The outcome of this test was the erection of distillate engines capable of running almost any kind of mining machinery. Immediately two 30 H. P. engines were installed, one to operate a 10-stamp mill, crusher, vanner, pump, and the other to run an air compressor operating three drills, besides handling all the hoisting from a 500-foot shaft. These engines have been in very successful operation, and on a basis of economy which netted a total saving equivalent to the price of coal. In other words, distillate and engineer cost no more than would have paid an engineer and fireman, thus saving the cost of coal, besides a saving in difference in original cost of plant as compared to a steam plant.

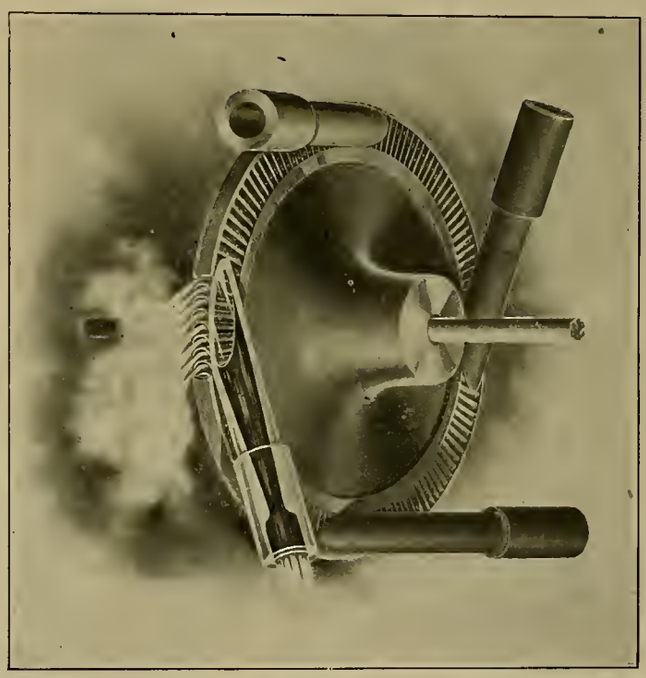
The DeLaval Steam Turbine.

The steam turbine is not a new discovery or based on a new mechanical principle. The first steam motor of which there is a record, that described by Hero of Alexander in 120 B. C., was a reaction steam turbine. It consisted of a spherical vessel mounted on trunions through which steam was admitted to finally issue from openings tangential to the equatorial circle of the sphere. Later, in 1629, Giovani Branca made a steam impact turbine, using a steam jet against the blades of a wheel.

The DeLaval steam turbine, illustrated herewith, embodies the general principles of this type of water wheel. It is simple in construction and direct in making its energy conversion, expanding steam adiabatically and completely. It is a high speed rotary steam engine and is adapted for all purposes where the ordinary type of reciprocating engine is used, and for many other purposes when the conditions are unsuitable for the reciprocating type of engine. The manufacturers say that great uniformity of rotation and close regulation are readily obtained with the engine and that its use is advantageous in connection with electrical machinery, centrifugal pumps, fans and blowers. The high speed and directness of energy conversion decrease the dimensions and weight and simplify construction without loss of efficiency. Its use also admits of an economy in engine foundations, the smaller sizes requiring no special foundation construction whatever. There is an entire absence of shock, it is claimed, in the turbine, and no weight of metal is required in the engine to resist it. A special advantage which the manufacturers claim is the efficiency under partial load which varies very little from the efficiency under full load. The DeLaval Steam Turbine Co. of New York are the manufacturers.



The DeLaval Steam Turbine Blower.



The DeLaval Turbine Wheel and Nozzle.

AN absolute grant of title to mineral lands in the Philippine islands, such as exists under the United States mining laws, is entirely unknown to the old Spanish mining law of that archipelago, which is considered to be in force at the present time. All the so-called titles are concessions or permissions, issued by the Governor-general under the provisions of the royal decree and the regulations thereunder, which concessions continue in full force indefinitely and until terminated by the failure of the concessionary to perform all the prescribed terms and conditions under which he holds his concession. These concessions, for failures of the concessionary to perform the prescribed conditions, may be terminated either by action of the Government, ex-officio, or upon complaint of any person entitled to apply for a mining concession, and who thereby gains a preference right to the granting of a concession to himself of the property against which he makes complaint, and, as all proceedings were purely administrative, the tenure of title was very uncertain and unsatisfactory.

Cyaniding Silver-Bearing Tailings.

Written for the MINING AND SCIENTIFIC PRESS by J. T. TERRY, JR.

The writer as chemist in charge recently worked 2500 tons of low-grade silver-bearing tailings at Amalie, in Kern Co., Cal. The following notes on the work may be of interest:

The values in the tailings existed in the form of silver chloride, sulphide and antimonate and yielded to treatment an extraction of about 80%. The plant comprised five 20-ton capacity leaching vats, a sump tank, a solution tank and a zinc box 16′x18″x18″ divided into seven compartments. The strength of strong solution used was .4%. The consumption of cyanide was six pounds per pound of precipitate recovered. The latter was worth on an average $8 per pound. The consumption of zinc shavings was at the rate of 1 8 pound per pound of precipitate produced. The tailings were handled by means of a scraper, the material being drawn up to the vats and shoveled in through a screen. The leached sand was discharged over the side of the vats and scraped away to a waste dump. Two shovelers and one teamster with scraper were all the laborers required, these being sufficient to discharge and fill a 20-ton vat and remove the treated tailings in ten hours.

Mining Experts.

A mining expert, to be worthy of the name, needs not only that knowledge of mine engineering in its details which the mining engineer has, but also that special and wider knowledge which embraces familiarity with ore deposits in many places and under diverse conditions, as well as knowledge of the business conditions attaching to the industry. To the school training of the engineer must be added that practical training in mining and metallurgy which is obtainable only by personal experience; so far there is common ground for both the engineer and the expert. In addition the expert must have a sufficient knowledge of, and experience in, practical geology to enable him to ascertain the structure immediately surrounding any given ore body, and must also have that inborn, or acquired, business sense which enables him to balance the certain cost of production per unit (under existing conditions) against the probable income per unit, from the venture. He must also be able to put these figures, together with the factors accruing from improved facilities, before his client in a clear, businesslike, and easily understood way. His technical views must be indisputable, while his economic views should be worthy of the greatest consideration, and subject to revision only by those men who are masters of finance in the marketing of the particular metals or ores under consideration.—Canadian Mining Review.

A Complex Vein Formation in Porphyry.

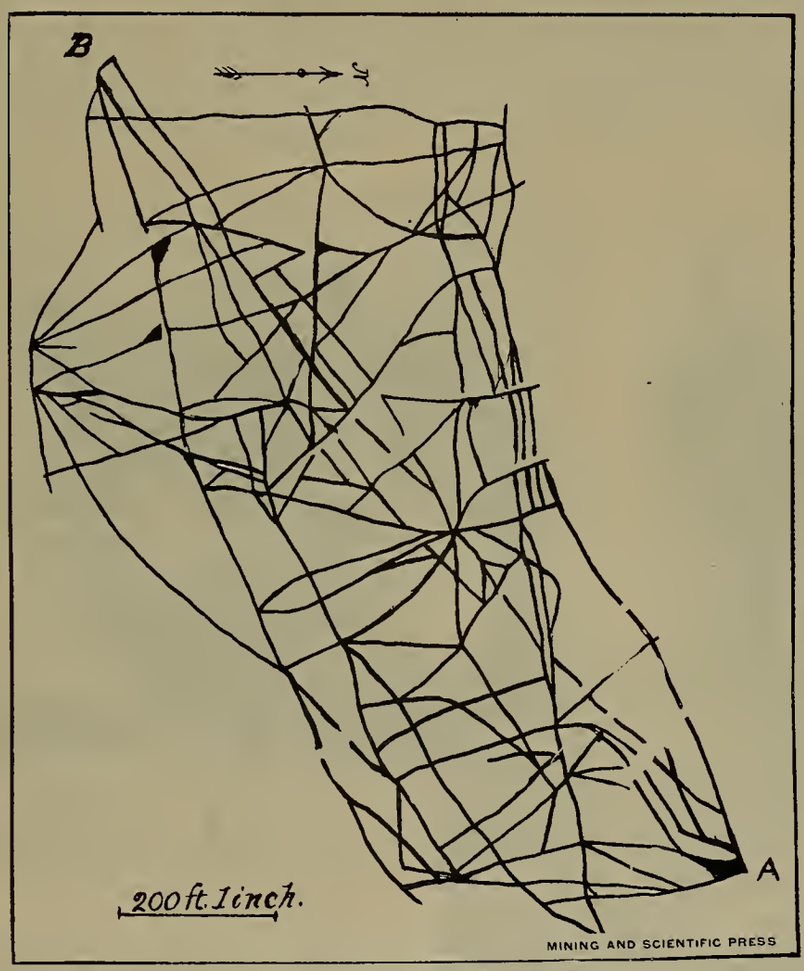
To the Editor:—Noting in the Mining and Scientific Press several extended articles on ore genesis, vein formation, vein enrichments, etc., illustrated by maps, I have been studying the same questions in the field and getting maps so similar, in some details to those referred to, that in parts they are almost identical.

The map presented herewith shows the mineralized quartz veins in a small porphyry dike near Jacksonville, Oregon.

There is no attempt to show all the actual bends and widths, only the location and strike of each vein, its breaks and crossings, as actually traced by survey.

The distance from A to B is nearly 1600 feet. At A the veins pinch and end, at B they come together and pinch to a 4-inch vein.

A few of the veins extend into the slate; the country rock bedding planes vertical, strike N. 20° E.; the quartz veins appear to be vertical or nearly so, varying in width from less than an inch to 30 inches.



Network of Small Quartz Veins in Porphyry Dike.

The lesson I learn from this map, in the light of the excellent articles above referred to, are that this isolated porphyry intrusion in slate, in some places passed above the present level of the slate, in others it did not reach it. Some portions of the slate were surrounded and partly mineralized. When, on cooling, strains from shrinkage became equal to the cohesion of the parts retaining the greatest heat, the line of greatest heat would be the line of least resistance, and along this line of weakness the force of the strain would cause cracks to form. Into these cracks the mineral-carrying waters would find passage, and room for exchange and deposition; leaching the metals from the porphyry, or bringing them up from the depths, as long as it remains hot enough, or the circulating waters retain their solvents.

The order of solution would seem to be in the order of solubility; deposition, the reverse of this; for instance, when iron is all carried off into the cracks, the solvents attack the more resisting metals, and, carrying them to the now formed mineral veins, finding the iron, drops the load in exchange for iron, which it carries farther on. Is not this metasomatic deposition?

On the rapidly cooled parts of this porphyry there was not time for the complete leaching, the silica crystallized, and the metals were deposited in place.

After the first cracks, further shrinkage strains—aided probably by seismic jars—caused a new set of cracks to form, making breaks in the first cracks; and these were themselves broken later. These secondary and tertiary cracks were sometimes wide enough that the mineral waters could not cross them, and deposited their loads at the break, extending laterally and rearwards, mineralizing the bank of the new crack on the side of the flow, thus making what has been described as local enrichment.

The new cracks having been made after one metal was nearly leached out, and another was being leached, they carried mostly the new metal, and only a small part of the metal deposited in the first crack.

In many instances I have sunk on the crossings and find that, almost invariably, there is an upraise, as if the water depositing the quartz found an obstruction, or a confluence, and built up a pillar at the crossing.

All of the veins on the map are, according to indications, more or less gold bearing; assays have proved each one sampled to be so. But this near surface sampling has not disclosed any very rich veins; possibly this porphyry cooled too fast to yield all its metal to the vadose circulation; or, being distributed into so many veins, there was no chance of greater concentration, thus forming a low-grade proposition, with, possibly, a far larger total content than is often found in one rich vein.

Joseph Voyle.

[Without intending more than a suggestion, it would be interesting to know if there are placer deposits that can be definitely connected with the vein system the writer describes. Vein deposits of gold of the kind described above are believed to be the source of the major part of the placer gold mined. The geological history and present topography of the Jacksonville, Oregon, region are such that it would seem possible to trace a connection between lode and placer where it exists. There is a peculiarity about some deposits, that are similar to the one described, as to the distribution of the gold in place that should be taken into account in estimating possible gold contents and in tracing a relationship between lode and placer. It has been frequently observed that the gold is not imbedded in either the quartz or the porphyry as a matrix, but rather in thin irregular plates found between the quartz and the porphyry. What are described as "seam diggings" in California are of this description. Some such deposits are known which were certainly the source of much placer gold.—Ed.]

The Standard Assay Certificate Form.

Written for the Mining and Scientific Press.

The forms that the Denver, Colo., and Los Angeles, Cal., assayers send are for the larger number report forms, which are intended to declare the result of treatment tests of ore. These are not assay certificate forms, strictly speaking, though they report the results of assays made in connection with the tests. These forms are all excellent for the purposes for which they are designed. The standard assay certificate form is not intended as a substitute for such working test report forms at all. These report forms report commercial results on a working scale, which is just what the miner wants when he has a working test made of his ore. The standard assay return form is proposed to be used, not with mill or concentration tests, but to report the assays that are made on the ore preliminary to any test at all. The working test reports show commercial values. Assay return certificates in the ordinary forms used now do not show commercial ore values on the face of the certificates. They merely provide the figures from which, if he know the rules, the miner can make an estimate of the commercial value of his ore. Most miners do not know the rules. The assayers do. The standard assay certificate form suggested by the writer would merely provide a uniform form on which the assayer would indicate the commercial values, and thus save the miner the uncertainties incident to making the estimation himself. Now the assayer, the expert metallurgist and the miner all want to know the composition of the ore and the ultimate values. While the commercial values alone make some suggestions as to commercial treatment tests, the main reliance for selection of such tests for trial is on the composition of the ore as determined by the assay and the ultimate possible values estimated from the composition and prices in the markets. This is also provided for in the suggested standard form.

The forms which the assayers send which have columns headed as follows: No.... Marked.... Gold, ozs.... Silver, ozs.... Lead, %.... Copper, %.... Zinc, %.... Iron, %.... Silica.... Etc. Value.... are the kind of forms the standard assay certificate form suggested is intended to replace. The idea is that when the prospector or miner brings the ore he has discovered and asks the assayer "what there is in it," the report of the assayer should fully show him on the face of the certificate of assay what the ore is worth commercially.

For mill, concentration, cyanide and other working tests there are special forms, and each assayer can most satisfactorily prepare his own forms for such reports. The suggested standard form is not proposed to take the place of all the forms that assayers use, but to substitute one improved common form for the many forms which different assayers use to report precisely the same facts. The writer is inclined to think that if the assayers used some of the forms on trial they would find that their customers would like them.

R. L. D.

U. S. Gold and Silver Production in 1901.

From the preliminary estimates of the Director of the Mint of the gold and silver production in the United States during 1901, there appears to be only a slight gain over the production of 1900. The yield of Alaska fell about $1,000,000. Colorado made a slight gain ln gold, and the other producers were nearly stationary. The yield of silver exceeded the 1900 yield by about 2,000,000 fine ounces. The total number of ounces of fine gold produced is estimated to have been 3,880,578, value $80,218,800, and the number of fine ounces of silver 59,653,788, having a commercial value of $35,792,200, The coinage value of the silver is approximately $77,000,000. Following is the Mint's estimated production by States:

States—	Gold, Value.	Silver, Ounces.
Alabama	$3,900	43
Alaska	6,904,400	5,000
Arizona	4,193,500	2,995,500
California	15,730,700	1,118,333
Colorado	29,000,000	20,833,333
Georgia	144,900	820
Idaho	2,273,900	4,000,000
Maryland	200	1
Michigan	20,000	102,000
Missouri	700	.....
Montana	5,023,300	14,500,000
Nevada	3,000,000	4,000,000
New Mexico	832,800	434,000
North Carolina	65,800	16,558
Oregon	1,777,800	125,000
South Carolina	120.900	316
South Dakota	6,601,800	364,120
Tennessee	200	5
Texas	1,100	447,400
Utah	3,824,300	10,250,000
Virginia	7,400	1,049
Washington	620,200	350,000
Wyoming	62,000	30,000
Totals	$80,209,800	59,573,478
British Klondike	$17,595,400	487,666

Corundum in Montana.

Written for the MINING AND SCIENTIFIC PRESS by J. A EDMAN.

Although corundum has been found for many years at various points in Montana, it has heen chiefly in the placer mines of the upper Missouri river, and as the precious and semi-precious variety of that mineral, known as sapphire. Ever since 1890 the mines at El Dorado Bar, Emerald Bar, French Bar, and other points on the Missouri river, ahout 10 miles east of Helena, have furnished some of this mineral, none of which, however, has heen used as an ahrasive.

In 1895 sapphires were found at Yogo creek, in the western part of Fergus county, and 10 miles west of the town of Utica. In the following year they were traced to a decomposed igneous dike traversing limestone. Mines have heen opened on this dike and have since furnished many valuahle gems and a limited amount of ordinary corundum.

A description of this locality hy W. H. Weed is found in his "Geology of Little Belt Mountains, Montana," at page 454, part 3, of the Twentieth Annual Report, United States Geological Survey.

These discoveries have not supplied any appreciahle amount of corundum suitahle for or ahundant enough for ahrasive purposes, and it was first dur-ing this year that a deposit was found that appears as if it might compete with the mines of North Carolina, which now supply corundum to the market of the United States.

I am indebted to Loverett S. Ropes, E. M., of Belgrade, Mont., for the following description of the mines which are situated at Elk Creek, Gallatin county, about 20 miles south of Belgrade, on the Northern Pacific Railroad:

"The geological formation," he states, "is chiefly gneiss, with hornhlende and garnetiferous slates, and resemhles in many respects some of the corundum deposits of North Carolina. The mineral occurs in a well-defined vein, 4 to 5 feet thick, of which ahout one-half is corundum-hearing. The vein has been traced for over 5000 feet and has heen developed on the surface for a space of 1000 feet."

From specimens in the writer's possession the vein matter appears to he a friahle reddish feldspar, with ahundant hlack mica (biotite-syenite) thickly-studded hy dark-gray corundum crystals frequently over ¼ inch in diameter hy 1 inch long, and generally in well-developed hut externally rough and pitted hexagonal prisms, slightly tapering and with the basal planes well developed. The largest crystal noted is 1½ inch long by 1¼ inch in diameter, and weighs 3½ ounces; specific gravity equals 3.88. The crystals separate easily from the gangue.

The rock sample on hand contains fully 40% corundum. In the vein it is estimated that a width of 2 feet will average 20% corundum, which can be cheaply extracted by crushing and concentration.

The locality of the deposit is sparsely timhered, but water power is availahle, and with facilities for transportation to market it is prohahle that the mines will become a profitahle producer of ahrasive corundum.

Most of this deposit is now owned by the Montana Corundum Co. of Bozeman, Mont., of which Columbus E. McCoy is president and Leverett S. Ropes, formerly of North Carolina, is the superintendent.

Important Decision to Dredging Companies.

Judge Prewett, in the Superior Court of Butte county, California, in the case of A. S. Hendricks vs. John Gale et al., over the rights of the parties to lands hordering on the Feather river at Oroville, which were valuahle for dredging, has rendered a decision, from which the following quotation is made:

This case involves the interpretation of the field notes of the survey of that portion of section 13 lying west of Feather river, in the county of Butte.

It appears from an inspection of the Government plat that it does not conform to the topography of the country as the same now exists. It does, however, conform to the meander line as called for hy the courses and distances in the survey. Whether the course of the river has changed since the survey, or whether the survey was originally erroneous, is now very difficult of ascertainment, and is, moreover, in the opinion of the court, immaterial to the determination of the issues in the case.

It is a fact shown hy the evidence in this case that the meander line is clearly and readily ascertainahle just as called for by the field notes of the survey.

It appears from very obvious mathematical computations that the area called for on the plats and in the patent is fully satisfied if the west boundary of lots 1, 2 and 3 be deemed established hy the meander line. But it appears from a long course of authorities which I find to be practically—and perhaps literally—without conflict that a meander line is not deemed to he the houndary of the adjacent tract where such adjacent tract is hy the field notes hounded by a river or other natural object.

In such case the houndary which calls for the natural ohject prevails over the courses and distances established hy the surveyor, the meander line in such case heing useful merely and only to show the area of the fractional subdivision. This heing the rule, and it heing altogether apparent that the Government survey did, in fact, meander up the left hank of Feather river in front of section 13, the owner of lots 1, 2 and 3 owns to the river, and this whether he thereby gets a much greater acreage than he paid for or not.

He takes to the river not hecause that the patent calls for the tract hetween lots 1, 2 and 3 and the river—for it manifestly does not—but hecause under the rule of construction adopted hy the Supreme Court of the United States, and many inferior courts, it is deemed the fact as a matter of law that lots 1, 2 and 3 reach to the river bank.

It seems to be immaterial in this action whether the tract is dispute was created hy gradual accretions, or whether the Government surveyor, in running the meander line, made a mistake.

In either case the plaintiff would take the land. If an accretion, he manifestly would take it under the law governing that topic. If the meander is erroneous, he takes it hecause the meander line is not the houndary, and the hank of the river prevails as a true houndary.

Geological Society of America Meeting.

The third annual meeting of the Cordilleran Section of the Geological Society of America took place at San Francisco and Berkeley, Cal., during the last two days of Decemher, 1901. The meeting consisted of a series of four sessions, the first of which was held in the council room of the Academy of Sciences in San Francisco.

The organization of the Cordilleran Section of this society marks a period of increased activity in the study of geological science on the Pacific coast. Not since the settlement of the west coast States has so much systematic study of geological prohlems engaged the interest of scientific men. A total of twelve papers were read and discussed at the several sessions of this meeting, all of which pertained to various prohlems of geology and paleontology characteristic of the West. The following is a list of these several papers:

"An Instance of Variahility in Rock Magma," H. W. Turner; "Postpliocene Uplift of the Sierra Nevada," H. W. Turner; "Triassic Reptilia From Northern California," John C. Merriam; "Ore Deposits of Shasta County, Cal.," F. M. Anderson; "Lake Chelan, Washington," H. W. Fairhanks; "Lake Quiheris (extinct), Arizona," W. P. Blake; "Orhicular Gahbro, San Diego County, Cal.," A. C. Lawson; "Geological Section of Coast Ranges," A. C. Lawson; "Petrography of John Day Basin, Oregon," F. C. Calkins; "Graphic Method of Representing Rock Analyses," A. C. Lawson; "Crystallographic Hahits of Colemanite," A. S. Eakle; "Stratigraphy of the Marine Pliocene and Pleistocene of Southern California," Ralph Arnold.

Most of these papers were read or discussed hy their several authors or ahly presented by members of the society. Some of them were of special interest. One of these was the paper hy John C. Merriam on "The Extinct Reptilia of Northern California."

Portions of seven skeletons, representing four or five species of Triassic saurians, were exhihited and compared with those found in other parts of the world. Their discovery is a matter of more than ordinary interest to paleontological science. The genus to which these animals helong has heen called shostosaurus.

A paper on "The Strata of the Coast Ranges," by Prof. A. C. Lawson, disclosed some surprising information. It was stated that the aggregated thickness of sedimentary rocks in the neighhorhood of San Francisco amounted to more than 30,000 feet.

"Neocene Basins of the Klamath Mountains," hy F. M. Anderson, was an attempt to show some of the most salient structural features of the Klamath mountains in California and southern Oregon, including not only their basins, but also their principal ranges. The three chief ranges of the group, extending in a northeasterly direction from the coast, and the drainage hasins intervening and otherwise associated form the main suhject of discussion. Of the two systems of ranges crossing each other nearly at right angles, the northeast and southwest ranges are the older and have exerted a controlling influence over the drainage since their heginning. The principal rivers of the region—the Rogue river, the Klamath and the Trinity—cut transversely across the more nearly north and south ranges, showing them to he younger in age than the lines of drainage followed hy these streams, and accordingly younger in age than the east and west ranges.

The historical development of these drainage basins is shown by the deposits contained in them, and for some of them it antedates the later Cretaceous epochs at least. The earliest drainage of the basin of the Klamath lakes is shown to have heen through the valley of Rogue river and to have heen diverted from that course to the present hy some of the later lava flows from the Cascades. Evidence is cited to show that during the Chico epoch this hasin was not connected with that of the Pitt river or the Sacramento, and it is maintained that its individuality has been kept almost unchanged to the present. As one of the larger streams of the region, therefore, the Klamath is younger in age than either the Trinity or the Rogue river.

The character and magnitude of the deposits of copper ore in the great ore helts of Shasta county were discussed. Three or four types of deposits were described, including some that were said to he the largest of the kind in western North America.

New Rules for Timber.

The Commissioner of the General Land Office, Binger Herman, has issued new instructions in cases of sales and also in cases of "free use" of timher in forest reserves. The rules are given here in part. In all cases of timher sale and "free use" applications the supervisor or ranger in charge of the work (preferahly always the supervisor) goes forth with the applicant to the piece of timher desired. If the timher is such that the forest officer thinks it advisable to cut, they agree on the manner of cutting, including such points as should go into the application. In the case of dead material, only wood standing or down is included. No leaves must he on the trees.

The question to he decided between the person wanting the timher and the supervisor or officer sent to arrange matters are: First, should applicant take all the dead material or only the standing; second, should he take all that is sound enough for fuel; third, should he take that only ahove a certain size, say, 4 inches in diameter; fourth, how should it be marked?

In case of live timher, the following points should go into the application: First, what is to he the smallest diameter; second, will many trees have to he left for seed trees; third, must tops he worked into cordwood, and to what size; fourth, if no cordwood is used, to what diameter will applicant utilize the timher; fifth, must the hrush he piled, and to what extent; sixth, is there any extra work going to he required of the applicant, such as cleaning up doty down stuff, etc.; seventh, how high are the stumps to be; eighth, how is cutting to he done; ninth, can applicant use anything and everything for skids, and should he pay for skidding, corduroy stuff, hridge and road material, etc.; tenth, what precautions as to saving the young and green stuff; eleventh, what camps, road, dams, etc., are going to be involved; twelfth, all trees will he marked and all marked will he cut.

After this agreement is reached, applicant makes his offer of price and signs the application on regular form. The marking and cutting of timher is an important feature of the transaction. All live timher is to he marked near the hase; all dead timher area is marked, and cutting is confined to that particular spot. The measuring of timher and woods will he done according to conditions; generally all is scaled and measured on the skidway or in the pile, according to the Scrihner rule in common use in many localities.

Lots less than $100 in value may he sold without advertising. In all other cases the timher is advertised.

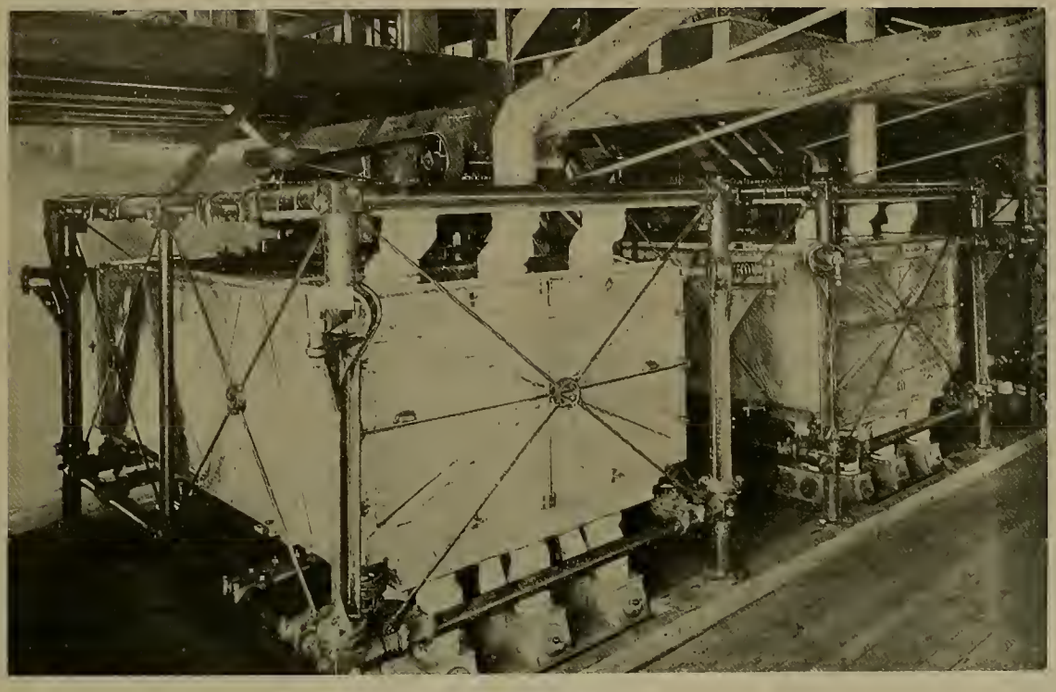
Mineral Experiment Stations.

Senator Gamhle, of South Dakota, has introduced a hill to estahlish in each of the mineral States and Territories a mining experiment station under the supervision of the Secretary of the Treasury. At each station is to he appointed an expert geologist at $3000 per annum, and one chemist at $2000, while an allowance of $5000 is made for estahlishing, equipping and maintaining each of these experiment stations.

It shall be the duty of the geologist and chemist provided for by this act to receive for assay or analysis all rock, cement, clay or other mineral-hearing substance that may be brought to them by any citizen of the United States, and make proper classification or assay of each sample for the purpose of ascertaining the exact amount of gold, cinnahar, silver, copper, wolfram, tin, or any other mineral known for its value, and to furnish at a nominal charge to each depositor a full assay and analysis, showing the quality and quantity of every mineral found in samples submitted. For a period of fifteen days the result of such analysis are to he kept secret from all except the party submitting the samples, after which time the results are to be posted, together with a statement showing the location of the country where the sample was found. When not necessarily engaged at the station the geologist is authorized to explore and examine mineral regions within his jurisdiction, especially in new and undeveloped sections, and make report on such examinations. The bill makes an indefinite appropriation for carrying out its provisions.

New Concentrating Plant.

In the month of December, 1900, the Crown Gold Milling Co. of San Francisco, Cal., through its president, A. J. Harrell, signed a contract with F. A. Flindt and S. W. Mosby, lessees of the May Day mine, Tintic, Utah, by which it agreed to install a "Crown Gold" dry concentrating plant of eighty tons capacity per day. The terms of the contract have been fulfilled, and the accompanying illustrations of the interior of the May Day mill show the machinery in place, so far as it could be photographed from one point of view. The concentrating plant consists of six sizing machines and four shaking tables carrying two belts each.



No. 1 Sizer in Operation.

Concentrators in Operation.

Quoting F. W. Wood, who installed the machinery: "The average May Day concentrates run from 45% to 50% lead, thirty-five ounces silver and about $3 in gold to the ton. The dust which, in ordinary milling operations, would be slimes, carrying the chlorides, is collected in the dust chamber. In the treatment of 100 tons of ore, running from 10% to 12% lead, eight to ten ounces silver and a small percentage in gold, there resulted about ten tons of slimes or dust, showing 20% to 28% lead, nineteen to twenty-one ounces silver; and where the ore assays 50 cents in gold to the ton, we find that the slimes or dust carry from $4 to $6 in the yellow metal, making a good shipping product without further treatment. The plant has been in operation several weeks and its capacity has been found fully up to requirements."

A detailed description of the Crown Gold Company's process was published in the MINING AND SCIENTIFIC PRESS on Aug. 11, 1900.

In perfecting his machines F. W. Wood, the inventor, has spent several years of painstaking study and work, with a view of saving a higher percentage of values from such mineral-carrying ores as are adapted to his process. All parts are fully covered by United States and foreign patents.

The company is composed of well known business men of San Francisco, and its machinery is not for sale, being placed only on a royalty basis, after careful investigation and tests of ore to be handled. Rights to the Republic of Mexico have recently been purchased by E. J. Molera and Lorin B. Doe of San Francisco, who propose to introduce the process in that territory at an early date.

The new home of the company is the three-story brick building Nos. 208–210 First St., San Francisco, Cal., where a 20-ton capacity outfit may be seen in operation. An illustrated catalogue, containing specific information, will be sent upon application.

Substitute for Borax in Soldering.

Among fluxes in use for hard-soldering and brazing borax has hitherto been best, because, unlike other fluxes, it is equally applicable to all cases of brazing and because it surpasses all other materials in dissolving different oxides. The use of the salt would be universal were it not for the fact that during the expulsion of its water of crystallization by heat it intumesces so strongly that it is shifted from the place where it has been put and often falls, together with the spelter mixed with it, into the fire. For this reason an excess of the flux must be used. Much material and labor would be saved if this objectionable property of borax were overcome. A further drawback to its use is that the surfaces to be brazed must be carefully cleaned before the borax is applied, and even contact with greasy or dirty fingers may spoil the surface for brazing.

Friedrich Pich, of Friedrichshagen, Germany, claims that he has overcome the above objections by substituting for borax constituents which form sodium borate during the brazing operation. Such constituents are boric acid and a sodium salt, like sodium carbonate. The action of the mixture, either constituent being in excess or not, is as follows: When the surface to which the mixture has been applied is heated or even if the mixture is applied wet, the sodium carbonate cleans the surface from grease and the like and then remains on the part cleansed. The boric acid tends to intumesce somewhat; but being intimately mixed with the sodium carbonate it is held in place. When the mixture is further heated, carbonic acid is given off and borax is formed. The latter is anhydrous under these conditions and does not intumesce. The dissolution of the oxides from the metals to be brazed is very energetic and rapid. Addition of salt to the mixture enhances the effect by rendering the molten mixture more fluid.

A Large Hydraulic Mine Pipe.

The Gold Pan M. Co. at Breckenridge, Colo., have installed a hydraulic elevator plant involving some novel construction. The company is exploiting a placer deposit extending for some miles in the valley of Blue river, which furnishes the water supply. A ditch 8 feet wide on the bottom, 4 feet deep in the solid and 12 feet wide on the top, having a capacity of 7000 miners' inches, is taken out from the river at a point about 4 miles above the lower portion of the placer, and is brought along the hillside for 2½ miles. The water then enters a pipe line 8000 feet long and 5 feet in diameter, made of steel plate varying from $\frac{3}{16}$ to $\frac{7}{16}$ of an inch in thickness, the whole line containing 1,720,000 pounds or 860 tons of steel.

To build the pipe a pipe-making plant was built at Breckenridge by a subsidiary company (The Gold Pan Engineering & Mine Supply Co.), equipped with pipe making appliances, including lathes, planers, riveters, steam hammers, shears, rolls, complete compressed air and electric plants. Compressed air is transmitted from the workshop to the ditch line, a distance of 8000 feet, and used for rivetting together the pipe in the trench and for caulking it. The pipe is made in lengths of 48 feet, each length weighing from six to seven tons. Each piece is dipped in a standard asphaltum dip mixture in a tank 60 feet long, 6 feet wide and 7 feet deep, holding 100 tons of dipping mixture, being the largest dipping tank in the world. All wooden flumes are painted with a weather resisting mixture. The 5-foot pipe distributes the water to hydraulic elevators and giants which operate under 350 feet head. A total lift of 90 feet is made by the elevators.

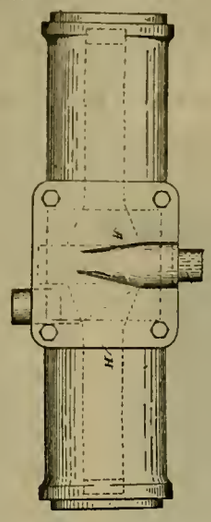
THE first steamship, the British tanker Clam, that ever crossed the Atlantic ocean with steam generated by means of liquid fuel instead of coal has just arrived at Philadelphia. The Clam is fitted with three ordinary return tube boilers. The oil-burning apparatus consists of a steam generator which atomizes the oil and discharges it into the furnaces. A firebrick structure is fitted upon which the oil impinges so as to secure complete combustion. One injector is fitted to each furnace.

Mining and Metallurgical Patents.

Patents Issued December 31, 1901.

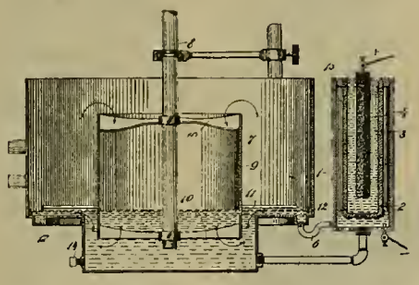
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

ROCK DRILL.—No. 690,042; Gov. D. Warren, Independence, Colo.



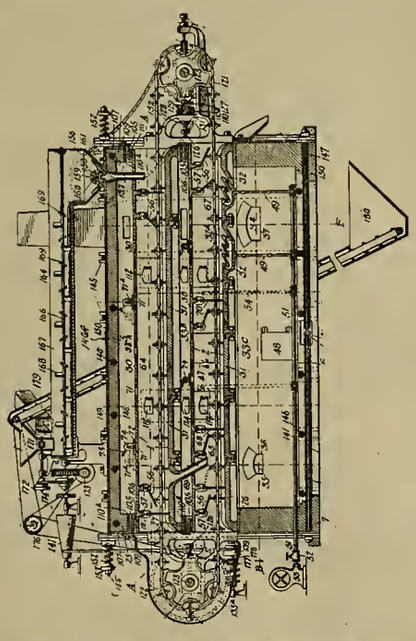
A cylinder, a valve in communication with cylinder, an operating arm carried by valve and adapted to enter cylinder at one side, a piston within cylinder, a shifting plate carried by one side of piston and projecting beyond its periphery, and having a reduced central portion adapted to receive valve-operating arm and cylinder having a longitudinal groove in side adjacent shifting plate and adapted to receive portion projecting beyond piston, whereby shifting plate is prevented from rotating with piston.

APPARATUS FOR TREATING GOLD ORES.—No 690,190; V. P. y Sacio, Yauli, Peru.



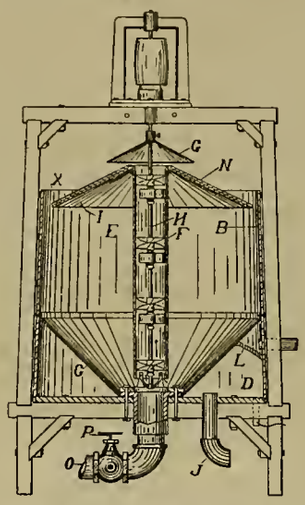
A receptacle having a wide upper portion with an annular collecting channel in its bottom and a reduced lower portion, a stirrer extending into both portions of receptacle, an electrolytic vessel or cell and passages leading from vessel to lower part of reduced portion of receptacle and to collecting channel respectively.

ORE TREATING FURNACE.—No. 689,946; A. M. Beam and H. S. Bailey, Denver, Colo.



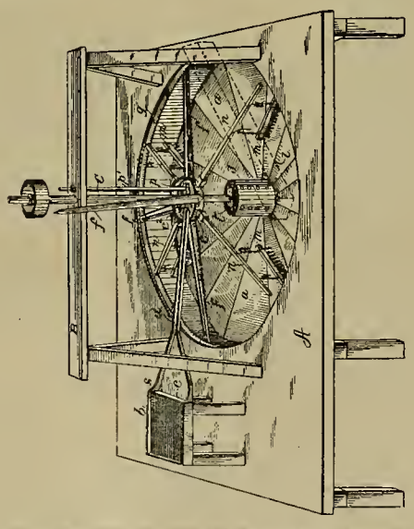
Inclosing walls containing muffles having swinging door partitions at their ends and compartments within one muffle, swinging door partitions arranged to separate one compartment from another and their communication with one another, means for moving position of doors to enlarge one compartment and decrease length of another, means including perforated floor sections, pipes built in walls and a blower attached to pipes for delivering heated air through across perforated sections of floor of muffle, so that air will pass upwardly through ore from its under side, means, including valves, for controlling volume of air admitted, means for admitting air to both sides of muffles, means including flues and a chimney for heating muffle, openings through compartments leading into flues, valves arranged to cover a predetermined number of openings, means including a lever and rod connected to valves and projecting through walls for moving valves to open and close openings and an ore-moving rabbling endless chain.

AGITATING MACHINE FOR CYANIDING.—No. 690,375; G. Rubsch, Jr., Los Angeles, Cal.



An agitating tank, having a conical bottom; a heating chamber surrounding conical bottom of agitating tank; means to heat chamber; a rotary pump, centrally disposed in agitating tank, adapted to take solution from bottom of tank and discharge it above top; a rotary deflector, adapted to distribute solution over a stationary deflector; and a stationary deflector affixed to casing of pump adapted to deflect solution to near edge of agitating tank.

ORE CONCENTRATOR.—No. 690,301; R. R. Lee, Pinos Altos, N. M.

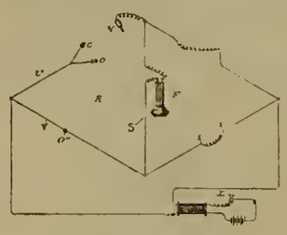


A circular pan, a central vertical rotating shaft carrying a rigidly attached bowl, two sets of radial arms connected to bowl in same horizontal plane, one set being provided with pendent and dragging rubbing devices, and alternate set being constructed as troughs rigid from end to end, but hinged at their inner ends to bowl opposite openings in same and extending to outer periphery of pan.

PROCESS OF MAKING SODIUM AMALGAM.—No. 689,926; E. B. Smart, Florence, Colo.

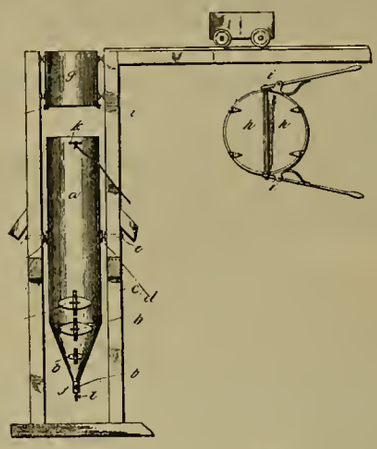
Heating paraffine to a temperature sufficient to melt it and alkali metal, then adding metal to melted paraffine and continuing heat until all metal is melted, the amount of paraffine employed being sufficient to cover metal when both are melted, then adding mercury to melted mixture of paraffine and metal, and then decanting paraffine.

APPARATUS FOR DETECTING AND LOCATING METALLIC ORES, MINERALS, ETC.—No. 689,849; F. H. Brown, Chicago, Ill.



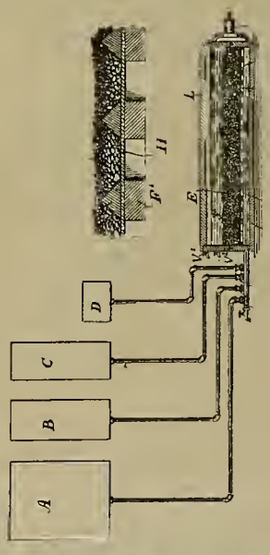
Circuit terminals independent of and freely movable with respect to each other and adapted to be brought into contact with the earth at various and widely separated points to close electric circuits which include earth between such terminals, and means for measuring resistances of earth portions of circuits.

APPARATUS FOR EXTRACTING GOLD AND CONCENTRATING ORES AND METALS.—No. 690,278; W. F. Heathman, Santa Ana, Cal.



A tiltable, elongated water holder, adapted to assume vertical and horizontal positions, and having a wide opening at its upper end and its lower end being tapered or conical and provided with a series of openings arranged one at apex, and others in side at different distances above apex, and an ore or metal receiving box fixed directly over water holder, and provided with means for releasing and allowing discharge of its contents simultaneously.

PROCESS OF TREATING METALLIC ORES.—No. 690,361; S. C. C. Currie, New York, N. Y.



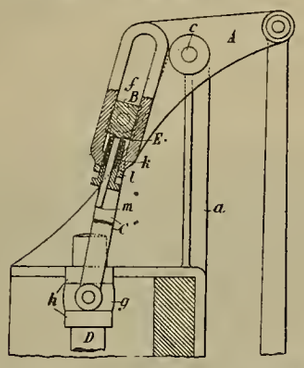
Washing them with water to remove all impurities therefrom, subjecting washed ores to a solution containing chlorine and a hypochlorite, and varying amount of hypochlorite during treatment of ores, so as to maintain resulting solution free from acid.

PROCESS OF EXTRACTING ZINC FROM WASTE PRODUCTS OF ROASTED PYRITES.—No. 690,205; C. Kellner, Vienna, Austria-Hungary.

Consisting in converting zinc compounds therein into sulphides by suitable means, converting sulphite into sulphate by a suitable oxidant, treating sulphate with an alkali metal or alkaline-earth metal chloride,

thereby forming chloride of zinc and sulphate of an alkali metal, removing latter and recovering zinc.

STAMP MILL OR BATTERY.—No. 689,955; W. Fowler and J. D. Ewen, London, England.



A stamp stem, a vibrating lever having two tubular guides or lugs f′ f′, a rod sliding freely in guides and links C connecting the slide bar with stamp stem, axis of tubular guides being arranged on lever to assume different positions in respect to axis of stamp stem.

PROCESS OF DISINTEGRATING AND COMMINUTING MINERALS OR ORES.—No. 689,959; E. L. Graham, Upper Warlingham, England.

First immersing ore without preliminary heating in a solution of sulphuric acid incapable of dissolving it; secondly passing an electric current of sufficient strength to disintegrate ore through solution and finally extracting metal from ore.

The Velocity of Steam.

By W. H. WAKEMAN.

The statement has been made, and evidently believed by some engineers, that if a round hole 1 inch in diameter should be bored in the shell of a tubular boiler, above the water line, it would be impossible to make steam fast enough in that boiler to maintain a working pressure. The size of the boiler was not given when I heard the above statement, except that it meant any boiler in ordinary stationary practice.

As many engineers have never given their attention to such matters, except in a very general way, I have concluded to make a sort of test case of this in order that the truth or falsity of it may be demonstrated so far as it can be by application of well-known principles, or in other words, it will be proved from a theoretical standpoint.

It is evident that our first business is to find how fast steam travels under these conditions, and here is a question on which the doctors seem to disagree, to use a common expression, for its velocity is stated at 900 feet per second by some writers, at 1450 by others, while the highest statement I have read places it at 3500 feet.

I can understand the cause of difference between the two former, but the latter surpasses my comprehension, therefore I leave it as a mystery for somebody else to solve.

It is an axiom that the velocity of steam as it emerges from a hole is due to the pressure behind which forces it out against atmospheric, or other pressure, but just how this pressure affects it is a point for consideration.

The velocity of steam is influenced in the same way that water is, when coming out of an orifice, at least to a certain extent. If we take a U-shaped pipe, both sides of which are 100 feet high, place it in a vertical position and fill it with water, the pressure at the base will be directly in the height of the columns of water, and it may be determined by multiplying the height .434 and $100 \times .434 = 4.34$ pounds. If we now proceed to cut off one side of this pipe at a distance of 58 feet from the top, the pressure under which the water will flow from it, provided the longer part is kept full, is 58% of the full pressure and $43.4 \times 58 = 25.2$ pounds, because it is due to the difference in height between the two sides of pipes.

We may prove this by calculating the pressure due to the height of each and substracting the lower from the higher. Cutting off 58 leaves 42 feet, and $42 \times .434 = 18.2$. Then $43.4 - 18.2 = 25.2$ pounds.

This illustration is introduced to show that in order to use the rule to be explained later on the lower pressure must not be more than 58% of the higher, but it may be any lower pressure without detriment.

Applying this to ordinary conditions where steam is blown into the air at sea level, we find that the lowest boiler pressure to be used is eleven pounds by the gauge, which is determined as follows:

Atmospheric pressure is taken at fifteen pounds and as this is 58% of some number, we may determine what that is by dividing 15 by .58 when the quotient is twenty-six pounds absolute, or eleven pounds by the gauge. Inasmuch as this is the least difference to be allowed it naturally follows that we may raise the boiler pressure as much as we desire without impairing the value of the rule for the velocity. It also follows that the lower pressure may be reduced to any point desirable, therefore if the steam is discharged into a vacuum the rule still holds good.

I may remark here that this does not seem logical, but it is the results of direct experiments and these cannot be disputed.

It is necessary to give the laws which govern the action of falling bodies some attention, as the velocity of water coming out of a pipe, or of steam blown into the air, is determined by the same law which gives velocity to a common ball when dropped from the top of a church steeple. Friction modifies the results in all cases, but does not repudiate the law.

If a weight be dropped from an elevated place, under conditions which prevent friction, it will fall 16.1 feet in one second, but it started from rest, therefore its final velocity must be double its whole travel, or 32.2 feet, as its motion is uniformly accelerated, and this will give it a velocity of 64.4 feet at the end of the next second. At the end of the third it will be 96.6 feet and for the fourth it will be 128.8 feet.

If it falls 16.1 feet during the first second, and its motion is uniformly accelerated, it will fall 32.2 feet during the next with the acceleration due to the first, to which must be added the 16.1 feet due to gravity, making 48.3 feet in all during that second, or 64.4 feet for two seconds, so that by squaring the time in seconds and multiplying by 16.1 the height may be determined.

It follows that if we know the height we can determine the velocity, which is the point of more especial interest in this connection. The rule for this is to find the square root of the height in feet, and multiply by 8. This rule is based on the principles above referred to.

Suppose that we have a vertical pipe of unknown height, full of water, and we wish to know how fast this water will run out through an opening at the bottom. Connecting a gauge to the bottom we note that the pointer indicates 43.4 pounds. Proceeding to multiply this by 2.3 the height is found to be 100 feet.

The square root of 100 is 10, and $8 \times 10 = 80$ feet per second. Study of the foregoing leads to a clear understanding of the rule for the velocity of steam as it is based on the same principles. The steam gauge on a boiler indicates the pressure the same as the gauge on the column of water does, and from this we may determine the height of a column of steam that would produce an equal pressure, if held in a vertical pipe, providing the lower part of it was filled with steam of density equal to that in the upper part of it. If it was practical to erect such a column, the lower part of it would be much more dense, as the weight resting upon it would produce this result, but it is assumed to be of equal density throughout.

Suppose that the absolute pressure is 100 pounds, and we wish to determine the corresponding height of a column of steam 1 inch square. A cubic foot of steam at 100 pounds pressure weighs .2307 pound. If it were to be divided into columns 1 inch square, 1 foot long and set one upon the other it would stand 144 feet high, therefore a column 144 feet high weighs .2307 pound. $144 \div .2307 = 624.18 \times 100 = 62,418$ feet required to weigh 100 pounds.

Put into the form of a rule this reads as follows: Divide 144 by the weight of 1 cubic foot, and multiply the quotient by the given absolute pressure.

The square root of 62,418 is 249.8.

It is not proper to multiply this by 8 as in the case of water, but by 3.6, as experiments have demonstrated this to be correct. Then $249.8 \times 3.6 = 899.28$ feet per second, which fully accounts for the speed of 900 feet mentioned in the first part of this article.

This is the rate before expansion takes place, but the instant the pressure is relieved, it begins to expand to atmospheric pressure at a ratio of 1.624, therefore the velocity is increased at the same rate, and $899.28 \times 1.624 = 1460$ feet, which accounts for the greater speed given by some writers.

When calculating the weight of steam discharged per hour from a boiler there are at least two ways of doing it, one of which is to take the velocity at the expanded rate, and the weight per cubic foot at the expanded pressure, which in this case is fifteen pounds.

The other is to take the velocity due to the pressure, or, in other words, to the height, as already explained, without expansion, and the weight at boiler pressure, which plan will be adopted here.

A round hole 1 inch in diameter, contains .7854 square inch, and the length of the stream of steam coming out in one second is 900 feet, or 10,800 inches.

Then $10,800 \times .7854 \div 1728 = 4.91$ cubic feet per second, or 17,676 cubic feet per hour, which weighs .2307 pound per cubic foot. This makes $17,676 \times .2307 = 4077$ pounds of steam per hour.

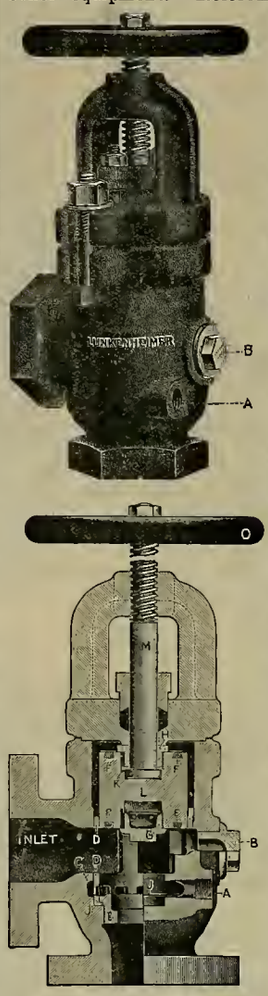
This will not be realized from an ordinary hole drilled in the shell, because it does not give the most efficient form.

If the hole was reamed out from the inside, so as to make a bell-shaped orifice, it would give the best result, but where a straight hole is drilled and nothing more done to it, we cannot expect to get more than .8 of the full capacity, and $4077 \times .8 = 3261$ pounds, or more than 100 H. P. if the feed water is supplied at 100° F.

A tubular boiler 66 inches in diameter with 100 3-inch tubes 15 feet long will supply this steam, if well set where there is a strong draft, using good coal. A smaller boiler can be made to do it, but it is not advisable.—Electricity.

The "Duro" Blow-Off Valve.

Blow-off valves have probably given more trouble than any of the other fittings which are part of boiler equipment. Referring to the illustrations herewith, it will be seen that the general form of this new valve (which has been designated by the trade name "Duro") is quite similar to the iron body angle blow-off valve which has been so extensively used for some years past. The object of this improved valve is to include the valuable points which the old-style valve possessed, and, in addition, a distinctive feature, the novelty of which, the manufacturers say, will at once impress users of its practicability. In old-style blow-off valves the seat is placed so that, as the disc approaches, scale and sediment will tend to collect and cut the bearing surfaces, making the valve leaky. In the "Duro" valve the plug fits snugly in a separate and easily removable bronze casing, which can be readily replaced when worn, and any accumulation of scale on the seat is prevented by a jet of steam blowing over the same.



SECTIONAL VIEW.

Referring to the illustrations, it will be noticed that there is a steam inlet A, and, on the sectional cut, it will be seen that this connects with an annular passage C. The iron body of the valve has a brass casing D, with circular slot J, cut into the side of same just below the level of the seat E. This casing D is held in place in the valve body by the seat ring E screwing over same, both of which are removable at any time for repairs or replacement with new parts. The opening A is connected to the steam part of the boiler and a suitable valve interposed. The object of this steam inlet A is to admit steam to C and J, and, discharging from the latter, blows across the seat, which will clean off any scale or sediment that may have accumulated on it, so that the disc and seat bearing, when in contact, will be perfectly clean.

In operating the "Duro" blow-off valve, when it is desirable to close same, the disc is screwed down in the usual manner. As it approaches the level of the inlet the edge of the disc passing the lower edge of the casing D cuts off a great deal of the flow of water, sediment, etc. At this time the valve in the steam pipe leading to inlet A should be opened and the steam admitted to the annular space C, from whence it passes through slot J and blows off the entire surface of the seat E. In the meantime the disc is being screwed home to the seat, which also cuts off the flow of steam from inlet A as well as the blow-off from the boiler. The valve in the pipe leading to inlet A can be left open at all times, as the disc of the blow-off valve would keep this outlet closed.

This valve is manufactured by the Lunkenheimer Co. of Cincinnati, Ohio.

THE totals of metal production of Colorado, including 1901, are: Gold, $290,032,713; silver, $367,011,581; lead, $106,084,770; copper, $13,723,374; total of the four, $776,852,438.

THE United States Mint at San Francisco, Cal., during the year 1901 coined $81,072,590, the largest annual output in its history.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

JUNEAU.

At the Ebner mine, in Silver Bow basin, near Juneau, twenty additional stamps are to be installed this spring. During November last all the ore taken from the workings was turned into the stamps for a test run without sorting.

KETCHIKAN.

The Laskawonda G. & C. Co. has been incorporated in South Dakota to operate the Ida, Teekalet and Gold Bluffs claims at Ketchikan, Alaska. The claims are located on a dike nearly 1000 feet wide lying between granite and diorite, and carrying gold and copper in values averaging between $6 and $10 a ton, principally gold. A shaft is to be put down 200 feet, and if values hold up with depth to put on a 100-ton concentrating plant. John Schonbar is Supt.

NOME.

The Nome mining interests of J. Lindberg and E. O. Lindbloom, who have heretofore operated as partners, have been incorporated as the Pioneer M. Co., capital $5,000,000. Some of the stock has been sold to residents of Stockholm and Stredberg, Sweden. The mines which the company will operate include claims on Anvil creek and other creeks at Nome which have proved rich gold producers. New machinery will be installed and a large force of men put to work.

ARIZONA.

COCHISE COUNTY.

Work has been resumed in the Big Fortune shaft of the Bisbee Con. C. Co. at Bisbee. The company will continue work in this shaft and also start sinking a shaft on another claim.——R. Cornell, Supt. of the Pearl G. M. Co., reports that a new tunnel has been started and that the company is taking out a good grade of ore for shipment.

At the Terrible mine, near Cochise, it is reported a 50-ton smelter is to be built. Additional stamps for their stamp mill at Cochise will be installed. S. L. Pearce is manager.

S. Miller, Supt. of the Gold Quartz & Copper Rock mine at Bisbee, states that the tunnel on their property is in about 258 feet and will strike the ledge in 45 or 50 feet more. The company proposes to spend about $20,000 in putting up machinery for hoist and tramway.

GILA COUNTY.

The Bobtail Mines Co. is obtaining a year's working bond at $25,000 on the Miller gold mine, about 18 miles east of Florence. The company is to commence work at once.

MOHAVE COUNTY.

The Treadwell group of mines, near Kingman, has been incorporated as the German-American M. Co., capital $1,500,000. C. F. Schader, general manager of the company, was formerly manager of the Peacock C. Co., near Lavic, San Bernardino county, Cal. O. F. Kuencer of Kingman is a large shareholder of the new corporation.

J. M. Murphy has shipped to the smelter a carload of ore from the Payroll mine, near Chloride, which it is said will average about three ounces gold to the ton, besides a small percentage of lead.

Davis & Harvey, who have been operating the cyanide plant at the Sheeprail mill, near Kingman, have made a final cleanup of 140 pounds of aurocyanides, worth, it is estimated, nearly $12 per pound. The tailings netted them, they claim, something over $4000.

SANTA CRUZ COUNTY.

A. T. Bird of Nogales has let a contract for sinking 100 feet upon the Wandering Jew mine in the Tyndall district. The ledge is said to be more than 200 feet wide and the ores carry silver and copper, with some gold.

CALIFORNIA.

The oil production of 1901 in California is as follows:

Producing Fields.	Wells.	Barrels.
Kern River	184	3,870,000
Los Angeles	1013	1,255,000
Newhall, Santa Paula and Ventura	293	612,000
Puente	34	141,500
Summerland	297	128,000
Coalinga	41	740,000
Whittier	55	512,000
Fullerton and Brea Canyon	59	724,000
McKittrick	22	430,000
Sunset	25	188,500
Midway	2	4,000
Santa Maria	5	7,500
Totals	2040	8,742,500

Average daily total production for one year, 23,000 barrels; approximate daily average production for November and December, 1901, 28,000 barrels; stocks on hand in all fields, December 31, 1901, 1,500,000 barrels.

AMADOR COUNTY.

The Bay State mine, located about 5 miles north of the town of Plymouth, it is reported is to resume operations. It is proposed to take the water out of the shaft and crosscut the west ledge. This property has been idle for two years.

At the Mackenzie mine, near Plymouth, prospecting still continues by the Stockton company and an engine and hoist have recently been put up. The shaft is now down about 85 feet.

BUTTE COUNTY.

The Gold Bank mine of Forbestown will, it is reported, resume operations on a large scale very soon. The prospecting has struck the ledge which was sought and found good ore. Since the mine closed down some months since a number of miners have been tributing and are reported to have been making more than wages.

The Boston & Oroville M. Co. has bought from W. P. Hammon and associates 513 acres of land in the dredging district on the west side of the Feather river, below Oroville, for $78,454.50.

CALAVERAS COUNTY.

C. Coulter of El Dorado and his associates have been developing the Martha and Ritter mines at that place. The three veins are in talc and black slate. A tunnel has been run on the pay shoot and a shaft sunk. The ore, Mr. Coulter says, goes $15 a ton.

Kiser & Nunes' Deep Gulch mine, near Mokelumne Hill, has been bonded at $5000 for three months to Eastern people.

The Monte Cristo, Good Hope and San Bruno mines, near Glencoe, have been bonded to Eastern people. On the Monte Cristo there is a 150-foot tunnel and a 3-foot ledge of milling ore.

The Blue Jay mine at Jesus Maria, which has been bonded to Boston people, will soon be started up. A 1000-foot tunnel will be commenced on the Calaveras river to tap the vein at a great depth. The present workings of the mine are on the summit, on the outcrop of the ledge. J. Gnecco and J. Courtmarsh are the present owners of the mine.

W. Hamilton of San Francisco, owner of the Ennis mine at Jesus Maria, is developing it.

A mill is to be erected at the Salvator mine at Jesus Maria, It is to be operated by water power.

EL DORADO COUNTY.

At the Montezuma mine, on the mother lode at Nashville, prospecting is in progress and the ledge is said to be improving. It is said the 10-stamp mill on the property will be started up.

Six men are employed at the Little Emma copper mine, at Centerville, driving a tunnel on the ledge. Some very rich ore has been mined, which has been sacked for shipment.

The Pilot Hill quartz mine, at Centerville, which has been closed for many years, has been bonded by W. A. Freeman and associates of Auburn. The work of reopening the mine will be begun at once.

Work at the Wilhelm quartz mine, at Centerville, which is being developed by a company of Auburn people, has been temporarily suspended until heavier pumping machinery can be installed.

HUMBOLDT COUNTY.

The gold beach mining property at Gold Bluff, owned by J. Chapman, has been sold to S. Whitlock and daughters of Darby, Conn., H. D. Munson of New Haven, Conn., and others for, it is stated, $50,000. Improvements to cost $50,000 more are projected.

KERN COUNTY.

The California Power Co., which is erecting an electrical plant on the Kern river, above Bakersfield, to supply electricity to Los Angeles and intermediate points, has completed its 2 miles of road over the precipitous bluffs from the intake to the site of the power house at an expense of $12,000. The construction of the 2 miles of tunnel through which the waters of the river will be diverted from the river is under way.

NEVADA COUNTY.

At the Sunflower mine at Grass Valley, under Supt. Ballou, a 5-stamp mill which has been in course of construction has been completed. A Standard concentrator has also been installed. A Sacramento company is operating this mine.

Ehmann & Friant have finished their contract extending the tunnel at the California G. & C. M. Co.'s claim at Spenceville. The tunnel is now in nearly 500 feet.

PLACER COUNTY.

J. E. Fisher, Supt. of the Shady Run quartz mine, reports the work of installing the new 10-stamp mill at the mine will be completed January 15th. This mine has been developed with a 700-foot tunnel, a shaft and numerous crosscuts. There are over 2000 tons of quartz on the dump.

The 20-stamp mill at the Mayflower drift mine, near Forest Hill, has been started on a test run of gravel from the upper lead. F. H. Green of Oakland is president of the company.

PLUMAS COUNTY.

The D. M. Bull mine, near Quincy, it is stated will be opened up at once. A wagon road from American valley to the mine is being built and preparatory work is being done to start sinking a double-compartment shaft.

RIVERSIDE COUNTY.

A. P. Wiley of Yuma, Ariz., is opening some gold quartz claims about 4 miles west of the Colorado river. He is sinking shafts on two claims.

SAN DIEGO COUNTY.

The California King G. M. Co. has done $1000 worth of work on each of the sixteen claims. The mill is in progress of construction and $50,000 has already been spent on it. The company has on hand 455 tons of steel rails with which to lay a 4½-mile track, which will cost $14,000.

SAN MATEO COUNTY.

An oil well near Purissima, on the ranches of Shoults & Wilson, bored by Sallee, Haynes & Guiberson, is reported to have yielded under pump thirty-eight barrels in one day.

SANTA CLARA COUNTY.

The Guadalupe quicksilver mines, near New Almaden, which have not been worked for some years, have been leased by the owners, J. V. Coleman, Isabella May, Cecelia d'Andridge and E. F. Preston, to H. C. Davey for a term of five years. He obligates himself to employ two shifts of not less than ten men each daily, also to make certain repairs. Davey is to receive as compensation a percentage of the quicksilver taken out. Work is to be commenced immediately.

SHASTA COUNTY.

M. W. Herron and A. W. Thierkoff of Redding have bonded the Mountain Lion mine, near Shasta, to F. B. Roberts for one year at $5000. The latter is to work the property and pay a royalty on all ore extracted.

The output of Shasta county mines for 1901 is estimated at $7,100,000, as compared with $5,574,026 in 1900 and $4,661,980 in 1899.

The Black Prince mine, near Igo, is to be developed. W. Robinson, of San Francisco, owner of the property, says a hoist to be run by water power is to be installed immediately and the shaft will be sunk 300 feet deeper.

SIERRA COUNTY.

The Thistle Shaft Co.'s tunnel at Gibsonville is now in about 1300 feet and about 75 feet advance a week is being made. It will require over 5000 feet of tunnel to strike the pay channel.

J. Brock and his co-owners in the Swansea mine at Chipps Flat have resumed work on their tunnel.

SISKIYOU COUNTY.

The Quigley ranch at Oro Fino has been bonded to a company for dredging. A drilling plant for prospecting is to be put on the ground very soon. D. Jones of Oro Fino, representing the company, has made arrangements to bond all the land along Oro Fino creek to Scott river for dredging.

The output of Siskiyou county mines in 1901 is estimated at $1,500,000, as compared with $1,010,383 in 1900.

There is very little water in the streams at Henley, and no mills are running owing to the cold weather, but extensive development work is being done in the Jillson, Gold Eagle, Wabana, Tyrer, La-Flesh, Mt. Vernon, Tiger and other smaller prospects.

SONOMA COUNTY.

The title to the Socrates quicksilver mine, in the northern part of Sonoma county, has been established by a court judgment giving F. A. Huntington 962½ feet of the mine, the Carr Realty Co. 750 feet, John Lloyd 150 feet and W. H. Troop 200 feet.

TRINITY COUNTY.

The output of Trinity county mines in 1901 is estimated at $1,050,000, as compared with $698,669 in 1900.

At the Fairview quartz mine at Minersville a drift has been run on the ledge 300 feet, showing it to be over 3 feet wide and rich in free gold. At present the mine is under bond to the Altoona Quicksilver M. Co.

TUOLUMNE COUNTY.

At the New Era mine, near Carters, owned by C. A. Holland, W. T. Carter, E. A. Wiltsee and A. Hines, the shaft is now down 210 feet. The face of the 200-foot level is in good ore, 4 feet wide, showing fine gold. It is believed to be the same shoot that was drifted upon in the 100-foot level for 150 feet. The worked in the 10-stamp mill upon the property averaged $10 to the ton.

A. C. Morison, Supt., has started men at work on the Atlas mine, Tuttlotown. The old shaft is being cleaned out and is to be carried down from the present depth of 120 feet to 600 feet.

F. P. Price of Big Oak Flat has sold the Lone Star mine in the Big Oak Flat district to M. J. Reid of San Francisco.

The Stanislaus Dredging Co. has sold to the California & Alaska G. D. Co. 250 acres of placer mining ground in Stanislaus river, near Robinson's Ferry.

The Good Return M. Co., an Eastern corporation, owns 120 acres of placer gravel on the Stanislaus river, near Columbia. It is reported that development work will soon commence. The river bed is believed to be especially rich at that point.

YUBA COUNTY.

The Boston & Oroville M. Co. has bought 2000 acres of gold dredging ground on the south side of the Yuba river, a few miles east of Marysville. Dredging, it is stated, will be commenced about March 15 of this year.

COLORADO.

The production of metal values during 1901 in Colorado is as follows:

Gold	$26,593,230
Silver	10,657,984
Lead	6,557,182
Copper	1,426,390
Total	$45,201,786

Zinc, iron, manganese, bismuth and tungsten are minor productions which would increase the total.

CHAFFEE COUNTY.

Near Granite the Cache Creek placer, F. O. Harvey manager, was worked on an extended scale during 1901. Mr. Harvey stated that the washings had been over 1,000,000 cubic yards of ground, covering a space of 140,000 square yards. He states work commenced April 25 and closed Nov. 15, and that an average of seventy men were employed at wages from $2.50 to $3 25 per day, and that the cost of washing the ground was 4½ cents per cubic yard.

The Eclipse mine at Monarch is being reopened. Recently Cripple Creek and Monarch people took a bond on the property at a nominal figure with a view of treating the vast deposits of low-grade silver-lead ore already blocked out. It is estimated that there are 100,000 tons, containing about $10 per ton. Two of the old dumps will run over $5 per ton. A 50-ton mill has been bought to treat this ore. It can be so cheaply handled that it is believed it will be profitable at less than $6 per ton.

CLEAR CREEK COUNTY.

At the Centennial mine, at Georgetown, on the sixth level a body of smelting ore going from $60 to $70 is reported. On the fifth level another large body is coming in. T. A. Watson of Boston, Mass., has been inspecting the property in the interest of the company that has been operating it the past year.

At the Kelley tunnel, at Georgetown, during December, the face was pushed ahead 40 feet and has cut the fifth lode since starting. Drifting on this lode will be commenced as soon as the main face is advanced past it.

The Yankee Con. M. Co. at Yankee has opened an 18-inch vein in the 250-foot level of the Faust mine that shows values of $145 in gold to the ton and strong traces of iridium, one of the platinum group. Capt. H. I. Seeman of Denver, president of the company, has returned to the mine.

DOLORES COUNTY.

The United Rico Mines Co. has been organized at Denver, to absorb and operate nearly every mine in the Rico district. The capital is $3,000,000 and represents present market values of the properties, it is stated. The officers are: President, W. N. McKelvey; vice-presidents, D. H. Moffat and S. Newhouse; secretary and treasurer, A. B. Roeder. P. S. Rider of Rico will be Supt. of the entire property. Among the mines included are the Enterprise, Rico-Aspen, Swansea, Rico Townsite & Milling Co., Atlantic Cable, Rico Mines Co., including the Rico smelter, of a capacity of 150 tons a day, and mill of 100 tons capacity; the Grand View, New Years, Hope group, the Rico Mines Co. properties composing the Rico Mines Co., a 150-ton smelter and a 100-ton mill; the Grand View group, the New Year group, the Hope & Cross group and other minor properties. In addition are the Lexington, Syndicate and Onomo Tunnel companies. The company also acquires the

holdings of the Grand View Coal Co., consisting of 320 acres of coal land 5 miles north of Rico. The office of the company will be in Denver.

EL PASO COUNTY.

The Portland mill at Colorado City, built by the Portland G. M. Co., is nearly completed and expected to start in full operation hy March 1.

It is expected that the new Telluride Reduction Co.'s bromide plant, which is heing erected in Colorado City, will be in operation hy April 1.

GUNNISON COUNTY.

The Patriot M. & M. Co. has been incorporated at Denver; W. M. Phillips, J. R. Schermerhorn, Jr., and J. C. Butler, capital of $500,000, to operate the Graham and New York lodes near Marble. The ore lodes are claimed to range in value from $5 per ton upwards.

HINSDALE COUNTY.

Late strikes made in the Golden Fleece property, near Lake City, are reported as improving with development. The ore, it is claimed, will run $20,000 in carload lots, the first carload shipment returns received heing $21,000. The ore carries tellurium. The vein was found in the tunnel, about 3100 feet from the mouth, and about 400 feet of work has heen accomplished since the strike was first made. The vein averages between 6 and 7 feet in width. The Golden Fleece property is equipped with a mill of 50-ton capacity.

The Ute and Ulay property at Lake City has installed a plant of machinery, including a 6-drill compressor.

LAKE COUNTY.

Leadville production for 1901 is: Gold, $1,749,858.76; silver, $3,976,053.71; lead, $2,370,646.89; copper, $357,420.84; zinc, $565,458.40; manganese, $87,059.30; hismuth, $17,000.

The zinc production of Leadville for the year was more than 36,000 tons, the greater portion of which was shipped to Europe.

At the Crown Point shaft, at Leadville, now over 800 feet down, the indications are said to he good. A plant of machinery is heing installed preparatory to pushing the shaft deeper.

A rich strike is reported made on the Pay Streak mine at Leadville. The rock carries gold, silver and lead and is said to run $180 to the ton. It was found about 2 feet from the surface.

PARK COUNTY.

The carload shipments of ore to smelters from Alma mines for 1901 were 147, against 123 for 1900. Gold from placer workings is estimated at $150,000.

SAGUACHE COUNTY.

The total output of gold for 1901 amounts to $90,000, which, with copper and other by-products added, runs up the production of the district to $100,000. The Independent mine is stated to have made two-thirds of the gold output.

SAN MIGUEL COUNTY.

The mineral product of this county for 1901 from the different mines is as follows:

Smuggler-Union	$850,000
Tomboy	815,000
Liherty Bell	610,000
Carriheau-Montezuma	150,000
Butterfly-Terrihle	110,000
Ophir Con	65,000
Alta	45,000
Milwaukee-Ophir	40,000
Menona	25,000
San Bernardo	57,000
Gold King	55,000
Peck Cyanide Plant	55,000
Miscellaneous shipments	125,000
Total	$3,002,000

The Menona Co., at Telluride, has had its mill remodeled and improved, crushers raised and reset, ore hins enlarged, a new electric motor installed and a 30 H. P. hoiler added for heating purposes and drying of concentrates. The mine has been developed and considerable new hodies of ore opened up. Ten stamps in the mill have been operated. In the spring it will be operated on a more extensive scale. R. W. Davis is Supt.

SUMMIT COUNTY.

Summit county's output for 1901 is as follows:

Gold from placers	$200,000
Gold from ores	300,250
Silver	200,025
Lead	179,830
Copper	10,800
Total	$890,905

TELLER COUNTY.

The Nahoh Co., during the past week, has started work on the Lookout Boy claim at Cripple Creek, and are at work sinking the shaft to 100 feet depth.

The Cripple Creek M. Co. has taken a two years' lease on the main workings of the Independence Con. Co., the Hull City placer at Cripple Creek. According to the terms of the lease the shaft is to be put down 400 feet during the first year. The shaft is down 800 feet.

The Cripple Creek & Colorado G. M. Co., which owns the Rittenhouse mine at Cripple Creek, will at once install over shaft A, the main workings of the company, a $30,000 equipment. Sinking is to be resumed in this shaft, and 1000 feet of work is planned without a stop. The shaft is now down about 500 feet.

Decemher tonnage output of Cripple Creek mines is estimated at 56,000, compared with 54,500 tons in March and 54,510 in October, which months were each in turn the holder of the record. March values were computed at $2,322,000, those of Octoher at $2,253,340, while the Decemher figure was about $2,500,000.

The Findley G. M. Co. has hought the Mountain Beauty fractional claim, containing ahout an acre of ground, at Cripple Creek, from the Mountain Beauty Co. for $50,000, the former company receiving $30,000 royalties now in court.

Lyon & Strickland, working the Elkton dump at Cripple Creek, since starting have shipped fourteen carloads of ore, averaging $30 to the ton in gold. The settling tanks are now in operation, and all the rock that is sorted is first run through a washer, and samples of the slimes indicate that they are worth $60 to the ton in gold. So far, for every six tons of rock handled, they have made one ton of ore.

IDAHO.

BOISE COUNTY.

G. Huppertz, foreman of the Washington mine, near Idaho City, states that the mine, of which C. Balhach is owner, has closed down for the winter owing entirely to lack of fuel. The mine will fill with water, making ahout $800 expense to pump out in the spring, hut this will be cheaper than pumping through the winter with green wood as fuel.

R. Winters, general manager of the Boston & Idaho G. D. Co. of Idaho City, states that his company is preparing to construct an additional dredger for its property early in the spring.

ELMORE COUNTY.

The Ella Hill G. M. Co., owning claims in Elmore county, has been incorporated. It is the intention to develop the properties, starting at an early date. The incorporators are H. A. Smith, A. L. Morris, F. Stauffer, E. A. Wilson, J. W. Burton, A. W. Gallagher and B. T. Cannon of Salt Lake City, Utah, where the principal office is located.

IDAHO COUNTY.

M. Hogan, manager of the Dixie mine at Dixie, during the past six months has crosscut the main vein at a depth of 300 feet with a 500-foot tunnel. The ore which has heen struck is the same as that in the Ajax property adjoining. The Hogan Bros. expect to put in a 20-stamp mill in the spring.

T. Johnson reports that the Henry Clews Co. of New York city, which recently bought the Banner mine at Florence, is putting in a 50-ton milling plant and that twenty-five men are now employed.

M. O. Reed, manager of the Mineral World mine, in the Seven Devils district, near Landore, has started a new tunnel on the 400-foot level. Assays of the ore, he claims, show 13.5% copper and $6.34 in gold and silver.

KOOTENAI COUNTY.

A 20-drill compressor and a concentrator are to he installed on the Continental mine, near Port Hill, hefore spring, according to A. Klockmann of Spokane, Wash., resident director of the Idaho-Continental M. Co., which owns the property. He states that there is 22 feet of concentrating galena ore in the lower tunnel that will go $26 per ton.

LEMHI COUNTY.

P. H. Clark of Nicholia has sold three claims in Spring Mountain mining district to W. H. Tibhals and associates of Salt Lake City, Utah. Mr. Tibhals says he found satisfactory showing of ore in the claims that yielded from 21% to 29.7% copper, 15 to 40 ounces silver and $1.40 gold per ton.

OWYHEE COUNTY.

The War Eagle, or Sinker tunnel, at Silver City, on Jan. 1, 1902, had reached a point 5930 feet from its mouth, with 280 feet more to run to bring it to a point beneath the collar of the old Elmore shaft. The pitch of the vein not being definitely known it cannot be told at just what further distance the tunnel will cut the ledge.

SHOSHONE COUNTY.

A 6-foot ledge has heen struck in the lower tunnel at the Copper King mine, near Mullan. The vein matter is banded, carrying hromide of copper, red oxide and pyrites.

MICHIGAN.

HOUGHTON COUNTY.

The output of copper from the Lake Superior district in 1901 is placed at 170,000,000 pounds, which figures hreak all previous records. The output hy mines is divided as follows:

Mines.	Pounds.
Calumet & Hecla	90,000,000
Tamarack	22,000,000
Quincy	20,200,000
Osceola	15,000,000
Wolverine	5,000,000
Atlantic	4,800,000
Franklin	4,000,000
Baltic	3,000,000
Isle Royale	2,500,000
Centennial	1,500,000

Calumet & Hecla and Quincy have surpassed in point of output any previous year.

MISSOURI.

The output of 1901 in the Missouri-Kansas zinc and lead region is almost $8,000,000. It was $20,454 less than in 1900, despite lower zinc prices. The total value of the zinc sold was $6,353,952, or $230,337 less than last year. The lead value was $1,617,699, or $209,883 more than last year. The lead sales of 1901 were the most remarkahle features of the year. This district was founded on the lead output, before sulphide of zinc was known to he valuahle; yet this year exceeds any previous year in the output of lead. It also leads any previous year in the output of zinc.

MONTANA.

U. S. Assayer B. H. Tatem, in his estimate to Wells, Fargo & Co. for the mineral production of Montana for 1901, places gold at 243,000 fine ounces, valued at $5,021,810; silver, 14.250,000 fine ounces, valued at about $8,550,000; copper, 250,000,000 pounds, valued at $40,750,000; lead, 10,000,000 pounds, valued at $400,000.

FERGUS COUNTY.

The shaft on the Big Six group of claims in the Gilt Edge district is down 100 feet and crosscutting from the hottom has been started. The group comprises five claims and was honded at $20,000 by Kendall & Co. in June, and since that time much prospecting and exploitation has been accomplished with very satisfactory results. The ore in the shaft is of the same general character as that of the Whisky Gulch mines, but is somewhat mixed with the lime formation and is rather low grade.

A new hond has heen given on the Mammoth group, north of the Great Northern M. & D. Co.'s properties at Gilt Edge. An incline shaft is heing sunk in the upper tunnel on the Mammoth claim. This tunnel, which is in the hill about 180 feet, is all in ore for the last 30 feet. This ore is all a high grade of cyanide ore, from which mill tests have recovered a little more than $10 per ton. The new hond on the group is held hy John Fitzpatrick of Meagher county, and it is reported that a milling plant will he erected on the group in the spring.

A strike is reported made in the Ahhey claim in the North Moccasins, owned by the Abbey G. M. & M. & Dev. Co. of Spokane, Wash., a rich hody of ore having been found at a depth of 125 feet from the surface. Assays run from $2.40 to $21.60 per ton gold. A mill is projected to be be built soon. F. S. Akley is Supt.

The Waldorf-Draper group, near Kendall, has heen developed by C. Ridell and fifteen men under the direction of A. S. Wright and A. H. S. Bird, with a view to operating the property. It is stated that there is sufficient ore in sight on the Santiago claim to guarantee the erection of a mill.

FLATHEAD COUNTY.

At the Snowshoe mine, near Lihhy, owned hy the Rustler M. Co. of Spokane, Wash., preparations are heing made to sink the 500-foot three-compartment shaft by contract. The telephone and electric light systems have been put in repair and preparations made for winter's work. D. P. Bowers is manager.

SILVER BOW COUNTY.

The new smelter of the Amalgamated C. Co., at Anaconda, work on which was started on June 18, 1900, is now practically completed, and has gone into commission. To huild the works more than 10,000 carloads of material were used. Of these 1000 carloads were of hrick. Twenty million feet of lumber were used in the huildings and 5,000,000 more in the 7 miles of flume huilt to give the plant a water supply. This flume delivers 50,000 gallons a minute into the tanks. Fifty thousand cuhic yards of masonry were constructed in the work and more than 250,000 yards of earth were excavated for foundations. The site of the new plant covers 300 acres, of which seven acres are covered hy the concentrator building alone. To construct the hins at the reverberatory building alone more than 7,000,000 feet of lumher were used. The new works will have a capacity for treating 5000 tons of ore a day. Nearly 900 men have heen employed almost daily in construction since the first earth was turned June 18, 1900. The building of this plant is said to be the largest work of the kind ever completed within such a brief period. G. D. Case of Copper Hill, Tenn., has been appointed general superintendent of the new smelter.

The strike of copper-silver ore in the Edith May mine at Butte is now helieved more extensive than at first supposed. The shaft is down 40 feet and drifting started in the vein with neither wall in sight. The mine is owned hy G. H. Casey and P. J. Brophy of Butte, and is leased to T. D. Heine, J. Newton, J. Cummings, G. T. Van Wart and J. White, also of Butte. The lessees propose to equip the property with hoisting machinery.

The shaft on the Sinbad claim in Butte is down 600 feet, and it is the intention of M. Genzherger and the Largey estate, the operatiors to continue to 700 feet The rock through which the shaft is heing deepened is very hard. It is stated that more than $50,000 has already been expended in the work.

NEVADA.

LYON COUNTY.

The Nevada Reduction works at Dayton have started up on Tonopah ore. The entire amount, it is stated, will exceed 300 carloads.

The Butters Cyanide Co., near Dayton, expects to handle 200 tons of tailings a day, 6000 tons a month, or 72,000 a year. At this rate over three years work will be required to dispose of the pile, which contains, it is estimated, a quarter of a million tons.

NYE COUNTY.

D. B. Lowe has taken an option on a group of nine claims at Tonopah owned by D. F. McCarthy. This group adjoins the Gold Hill and G. & H. mines.

Brougher Bros. & Co. are at present drifting from the 120-foot level on the Gold Hill property at Tonopah, where they have opened a large vein of shipping ore.

Discussing results that have heen achieved by the lessees on the Mizpah lode, owned hy the Tonopah M. Co. at Tonopah, Manager Oddie, who was one of the original owners of the property, said that one of them had netted as much as $700,000, while those interested in the O'Meara lease will have divided $500,000 hy the time their entire output shall have heen sold.

The Golden Anchor M. Co. has been incorporated at Salt Lake City, Utah, capital $500,000. D. S. Truman is president and G. A. Land secretary and treasurer. The company owns the Golden Anchor mine at Tonopah.

WASHOE COUNTY.

The Colorado-Nevada M. Co., of Cripple Creek, Colo., has hought eighty acres of land adjoining the Bell mine at Reno, and it is stated intend to start at once to open up the mine, putting in a plant of hoisting machinery. The officers of the company are: T. A. Morath, president; J. L. Middlaugh, secretary, and R. R. Arnold, manager.

The installing of the machinery of the Reno Star mill has begun. It will he a leaching plant with a capacity of twenty tons a day. A larger mill would have heen put in, but uncertainty as to the character of the ore below water level made it inexpedient. There is enough ore on the dumps to keep a mill running steadily for several months. It is expected to have the plant in operation hy the middle of February.

WHITE PINE COUNTY.

The Ely M. & M. Co. of Salt Lake City, Utah, owning the Ely mine at Ely, has made the last payment of $10,000. The mine is said to be looking well.

NEW MEXICO.

EDDY COUNTY.

This county is said to he having a copper excitement. Claims are being staked in the Guadalupe mountains, most of the new locations heing made in the Devil's Den district, near the head of Dark canyon, near McMillan. Assays of the ore are said to run from 20% to 55% in copper, with a trace of gold. A numher of Fort Worth, Tex., people are interested in the claims 60 miles north of Carlshad.

OREGON.

BAKER COUNTY.

The Virtue mine at Baker City has made a cleanup of over $60,000 for Decemher, the largest amount by half that has ever heen taken from the mine in any month since its discovery in 1864. It is owned now hy a Montreal company. The present manager, A. Buckhee, discovered a pay streak in some of the old surface workings and the mine has paid well for

several months. Arrangements are being made to pump out the water from the lower workings.

At the Concord mine at Lawton, J. H. Robbins of Sumpter, president, a strike of 4 feet of $70 free milling gold ore has been made in the surface of the Blaine drift at a depth of 600 feet.

The Golden Reward M. Co. has bought the King Solomon tunnel at the foot of Baisley-Elkhorn mountain, near Sumpter. This tunnel will be enlarged to 7x8 in the clear, timbered with square sets of sawed timbers, and will be driven 3000 feet under the mountain, crosscutting 15 known quartz ledges. It will tap the Lillian group and the group recently bought by C. C. Nepple at 2000 feet vertical depth.

Recent estimates show that the Standard G. & S. M. Co. has expended on its property near Quartzburg over $20,000 on improvements and development. A large and well-defined vein has been exposed containing gold, cobalt and copper. It is said there are 1000 tons of ore on the dump that will average nearly $100 to the ton. The smelter will have a capacity of about twenty-five tons daily.

It is estimated that about 2000 men are regularly employed in the mines of Baker and Grant counties at an average daily wage of $3, and that within three or four more months 500 to 1000 more men will be at work. Eleven stamp mills, with 190 stamps, are in operation, and the number of stamps in these mills may in some instances be doubled in spring. Seven new mills will be erected for several mines that will soon be added to the list of producers.

The machinery for the mill and cyanide plant at the Flagstaff mine, near Baker City, is put in place. Supt. McLain says the new plant will begin operations by Jan. 15.

It is stated that for the month of December one Baker county mine produced $91,000 and four others $46,000, $60,000, $30,000 and $20,000, making a grand total for the month just closed of $247,000.

GRANT COUNTY.

It is reported that a strike has been made on the Red Boy mine, near Granite, on the Monarch-Red Boy ledge, which averages over $100 to the ton.

JACKSON COUNTY.

The quartz property recently located by Perkins & Pike in the Dry Diggings district is being found more extended and carrying larger values as it is further developed. Its width first stated at 200 feet has been found much greater. A shaft being sunk now down 10 feet opens ore which assays $9 per ton. A mill test of the lower grade rock gave returns of about $1.50 in gold, besides good values in concentrates. The ore is soft and can be mined and milled cheaply.

The Behrman property of the Meadows district, near Jacksonville, comprising 800 acres of cinnabar bearing claims which has been under bond by English people for several months, it is reported, is to be bought by them for $400,000. They will put in an extensive working plant.

At the Mayfield cinnabar mine, in the Meadows district, near Jacksonville, a strike is reported made on the 200-foot level of a body of high-grade cinnabar. The Mayfield is one of the cinnabar claims of the Rogue River Quicksilver M. Co., which is operating in the Meadows. From a small hole 10 feet in depth and 4 feet across in the Mayfield $4000 worth of cinnabar was removed a short time since. The company has put in a complete modern roasting plant and equipment. Besides the claims of the Rogue River Quicksilver M. Co., there are a dozen or more other claims in the district being developed.

Shook & Stanley have started sinking on the ledge of the Deerhorn mine, near Jacksonville, from the level of their 90-foot tunnel. The ore carries gold, copper and silver. Much of it is free-milling gold ore, but the best of it is base.

The Beaver Creek M. Co., near Jacksonville, is extending the ditch from North Beaver creek to their old placer ground, 3 miles below. Coleman & Starkey have the contract to construct this ditch at $2 per rod. It is to be 2 feet wide at bottom, 3 feet at the top and 18 inches deep. This illustrates about the average cost of running placer ditches in this region in ground comparatively free of rock.

G. F. Fendall has struck some good gravel on his mine on Grouse creek, about 1 mile above Beaver.——Thompson's upper claim and water right on Hungry creek, near Coles, Cal., had been bought and a mill is to be built.

LANE COUNTY.

The Oregon Con. M. Co. has bought mining properties on upper Cow creek, formerly owned by the Victory M. Co., for, it is stated, $25,000. The principal members of the new company are Judge T. Carroll of Tacoma, Wash., W. J. Morphy of Chicago, Ill., G. A. Cole of Missouri, F. Eidomllier, D. Phelps, F. H. Miller and A. N. Mills of Oregon. There are thirty claims in the property, chief among which is the Victory hydraulic mine. Work has been started.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The gold production of the Black Hills for 1901 has been $12,000,000, an increase of $2,000,000 over 1900. The increase is due to increased capacities and improved facilities in mills and reduction works of the older companies and to the building and starting of a number of new mills. The greatest increase is in Lawrence county. The Homestake M. Co. alone has yielded approximately $1,000,000 more than in 1900. The new 1200-ton cyanide plant saves values that had previously escaped, amounting to about $30,000 a month.

UTAH.

BEAVER COUNTY.

Supt. D. Maudlin of the O. K. mine reports that the drift on the 400 level is now entering a body of high-grade sulphide ore. W. M. White, the Majestic Co.'s engineer, reports that Supt. Maudlin estimates that there are 10,000 tons of 40% copper ore in sight. There are, he states, on the dump 35,000 tons of ore that will average $16 per ton, and which, with a plant on the ground, could be treated at a profit. During the year the old workings have been cleaned out, new buildings built, 1000 feet of shafts and drifts run and $75,000 worth of ore taken out. This ore was taken out of a chamber 20 feet wide and 10 feet high.

G. L. Hutchins, engineer for the Bluebird M. Co, reports that a large body of high-grade ore had been struck in the Copper King mine of the company, near Milford. The ore carries copper, gold and silver in a vein 150 feet wide. The intention is to sink a large vertical shaft.

After several years shut down the old Rob Roy mine at Beaver City has been started up, with A. L. Fotheringham as manager.

BOX ELDER COUNTY.

O. P. Connor, manager of the Brooklyn mine of Park valley, states that the development work to date consists of about 300 feet of tunnels and crosscuts which show the vein carrying an average of about $20 in gold and 8 ounces of silver to the ton. The vein is from 12 to 16 feet thick. Cabins, a blacksmith shop and an assay office have been erected. A mill for the treatment of the ores of the Brooklyn will eventually be erected.

JUAB COUNTY.

Tintic production during 1901 was 2,363,993 pounds of copper, 377,216 ounces of silver and 7966 ounces of gold.

SALT LAKE COUNTY.

Lathrap & Effinger have sold their interest in the Tiewaukee group at Bingham for, it is said, $50,000. The Detroit company owning it is crosscutting from present level of deep shaft to cut the Columbia vein, which should be reached this month. A. Johnson is Supt.

TOOELE COUNTY.

F. Dole and associates are developing five copper-silver claims in the Wildcat range, 55 miles west of Grantsville. In opening up the group Mr. Dole has sunk a 100-foot shaft, and at that level, in a crosscut, the ore found assays several hundred dollars in silver and copper per ton. The vein is 9 feet between walls.

WASHINGTON.

FERRY COUNTY.

The California mine at Republic is stoping 100 tons of ore from the 100-foot level for shipment to the Granby smelter.

Supt. C. T. Porter of the Gold Lion-Little Four Co. says he is driving the tunnel ahead about 2 feet daily.

S. L. Boyer has leased the El Caliph mine at Republic for one year and has started to develop it.

STEVENS COUNTY.

The Enterprise Marble Co. has been incorporated at Spokane, capital $150,000. The trustees are J. W. Twohey, G. H. Walters, C. E. Smith, I. P. Leach and E. Twohey, all of Spokane.

WYOMING.

CARBON COUNTY.

The Indianapolis C. M. Co. has bought the Iron King group of eleven claims on Cow creek, Grand Encampment district. The group is at present developed by a shaft which shows a 12-foot vein carrying gold, silver and copper in paying quantities. The company will install a plant of machinery in the spring.

The New Rambler mine in the Douglas creek district has been sold for $500,000 to C. M. Kittredge of Omaha as agent of the Amalgamated Copper Co., the price to be paid in thirty days.

FOREIGN.

BRITISH COLUMBIA.

W. H. Aldridge of Trail states that the Canadian Smelting Works will begin at once the construction of a refinery at Trail of sufficient capacity to handle the present bullion output of British Columbia.

A strike has been made in the Center Star mine, at Rossland. In the east drift on the 600-foot level the face broke into a large body of ore, equalling in grade the best quality of ore encountered in the upper workings. About the same time the contractors in the shaft cut what appears to be the same ore body. The new strike in the 600-foot level is taken to indicate that the mine possesses excellent ore at depth.

The Granby smelter, at Grand Forks, closed down while the connections were made between the blowers and the two additional furnaces just installed. The enlarged plant has a capacity of 1300 tons daily. The new converter plant will treat daily from 100 to 150 tons of matte.

MEXICO.

The Old Mexico M. & M. Co. has been incorporated at Seattle, Wash. J. M. Roberts is president, J. B. Ault secretary and treasurer, and L. Wood general manager. The office is in Seattle. The company has bought three mining properties in Chihuahua, Mexico, located about 3 miles west of the town of Morolos and 85 miles west of St. Barbara, a station on the Parral & Durango Railroad.

Personal.

T. A. RICKARD of Denver, Colo., is at Butte, Mont.

T. ROONEY of Virginia City, Nev., is at Grass Valley, Cal.

WILLIAM A. FARISH of Denver, Colo., is in San Francisco, Cal.

JOHN HARRIS is manager Silver Crown Con. M. Co., Ymir, B. C.

"JIM" WARDNER is now operating variously in Clifton, Ariz.

F. E. WILLSON of San Francisco is in Arizona on a thirty-day trip.

O. F. KUENCER has returned from Los Angeles, Cal., to Kingman, Ariz.

GEO. M. CLARK is the present Supt. River Hill mine, Placerville, Cal.

THEO. F. VAN WAGENEN has returned from San Francisco to Lovelock, Nev.

R. J. COLEMAN of Salt Lake City, Utah, has returned there from Tonopah, Nev.

D. A. MCDONALD has returned to San Francisco, Cal., from Golovin bay, Alaska.

W. E. MORROW is supervising the construction of the Yak tunnel, Leadville, Colo.

H. VAN F. FURMAN of Colorado visited the California King mine, Picacho, Cal., Dec. 21.

JOHN MCCONAGHY is now general manager Colorado Mines Con. M. Co., Robinson, Colo.

M. BANHAM succeeds G. W. Teagarden as manager R. O. G. M. Co., Georgetown, Colo.

A. G. HEFFRON of the Bingham C. & G. M. Co., Salt Lake City, Utah, is in Tonopah, Nev.

S. F. PARKS, Amador, Cal., assumes a position with the Darien G. M. Co., Colombia, S. A.

R. H. CHANNING is now general manager Highland Boy M. Co.'s property, Bingham, Utah.

J. J. HARDWICK of Phœnix, Ariz., is general manager of the Melczer M. Co., Copete, Sonora, Mexico.

N. S. KEITH, W. J. SUTHERLAND AND C. F. VON PETERSDORFF are now residents of New York City.

MANAGER G. W. KEEL of the Butterfield mines, Bingham, Utah, has returned there from New York City.

E. C. LOFTUS has been appointed Supt. App mine, Quartz Mountain, Cal., succeeding W. Moorehead, resigned.

A. JOHNSON of Cripple Creek, Colo., has succeeded J. C. Roberts as manager Tiewaukee mine, Bingham, Utah.

JOSEPH M. NOUGUES, JR., Supt. Josephine mine, Volcanoville, Cal., was in San Francisco the early part of the week.

R. WINTERS, manager Boston & Idaho G. Dredging Co. of Idaho City, Idaho, has returned to that place from California.

COL. THOS. H. HANDBURY succeeds Lieut. Col. C. E. L. B. Davis as chief engineer officer of the department of California.

GARDNER WILLIAMS, general manager of the De Beers Diamond Co., has returned to London from a visit to California.

HOWARD B. COLLINS is now manager Big Evans M. Co., Arnold L. & M. Co., Reno M. Co. and Empire Gulch M. Co., Leadville, Colo.

F. L. ODDIE, general manager, and T. J. Siebert, Supt. of the Tonopah M. Co. at Tonopah, Nev., have returned there from Philadelphia, Pa.

H. G. MURRAY, formerly with the Gwin mine, near Mokelumne Hill, Cal., but for several years in Korea, is in San Francisco. He expects to return to Korea.

L. A. DUNHAM is Supt. Clifton Con. Copper Co., Clifton, Ariz. He has two electric drills in operation and proposes putting in a diamond drill for prospecting work.

COL. J. A. FLEMING, president of the Black Warrior C. Co. at Black Warrior, Ariz., has arrived at that place from New York to give his personal attention to the completion of acid works at the mine.

JOSEPH L. HUTCHINSON, Supt. Trade Dollar mine, Silver City, Idaho, has resigned and will locate at Boise City, Idaho, temporarily. It is understood that J. McDonald, who has been the mine foreman for several years, will be made Supt.

W. B. MOORE has resigned as foreman at the La Mina Veta Grande mine of the Cananea Con. C. Co. at La Cananea, to accept a similar position at Santa Rosalia, Sonora, Mexico, with the Santa Rosalia M. Co., of which S. Kempton is Supt.

CLARENCE K. COLVIN resigned on the 1st inst. as manager Boston & Denver Con. M. & M. Co. of Gilpin Co., Colo., which position he has filled for the past four years. Mr. Colvin will resume his profession of mining engineer at Denver, Colo.

W. M. CURTIS of Detroit, Mich., is in San Francisco. He has a tin brick smelted in San Francisco from some tin ore he brought from Alaska. He says that 4 miles from Nome, Alaska, his company has located 2200 acres containing tin ore in commercially profitable quantity.

WILLIAM S. GRAHAM, civil and mining engineer and county surveyor of Auburn, Cal., has been confirmed by the Senate as U. S. Surveyor General for California. Mr. Graham is well and favorably known in his profession and his qualifications for the office to which he is appointed are exceptionally high.

A. H. BROWN, general manager Bully Hill mines and smelter, DeLamar, Cal., has resigned and accepted appointment to the same position in connection with the Trinity Copper Co., at Kennet, Cal. He will continue his connection with De Lamar's enterprise as consulting engineer and, it is said, will have the appointment of his successor as manager.

Recently Declared Mining Dividends.

	Payable.
Bunker Hill & Sullivan M. & Con. Co., Idaho, $21,000	Jan. 6
Mary McKinney G. M. Co., Colorado, quarterly 3 cents per share, $30,000	Jan. 10
Vindicator G. M. Co., Colorado, quarterly, 3 cents per share and 5 cents extra, $88,000	Jan. 15
Daly-West S. M. Co., Utah, monthly, 40 cents per share, $60,000	Jan. 15
Rambler-Cariboo M. Co., B. C., 1 cent per share	Jan. 25
Parrott S. & C. Co., Mont., quarterly, 50 cents per share	Jan. 27
Calumet & Hecla M. Co., Mich., quarterly, $10 per share, $1,000,000	Jan. 29
Goodenough M. Co., B. C., 1 cent per share	Jan. 30
Yankee Con. M. Co., Utah, No. 1, 3 cents per share, $25,000	Feb. 1

Commercial Paragraphs.

THE Denver, Colo., headquarters of J. Geo. Leyner Co. are now at 1033 Seventeenth street, where the finely fitted offices evince progress and prosperity.

PLANS are reported completed for the first iron and steel works in Mexico, to be erected at Monterey, province of Nuevo Leon, in northern Mexico, by the Campania Fundidoro de Fierro y Acero de Monterey. The plant is to be built by Americans, and operated largely by American managers.

Catalogues Received.

Catalogue No. 2, "Hoisting and Haulage Engines and Appliances," from the Allis-Chalmers Co., Chicago, graphically illustrates and plainly describes apparatus in use in mine hoisting, with considerable technical information. The diagram on page 111, "Proper Working Load for Steel Hoisting Ropes," is illustrative of the practical values of this trade treatise. It is from the press of the Meisenheimer Printing Co., Milwaukee, Wis., and is a typographical gem.

Latest Market Reports.

SAN FRANCISCO, Jan. 9, 1902.

SILVER.—Per oz., Troy: London, 25 13/16d (standard ounce, 925 fine); New York, bar silver, 56c (1000 fine); San Francisco, 56c; Mexican dollars, 44¾c San Francisco, 44¼c New York.

COPPER.—New York: Lake, 1 to 3 casks, $14.40; carload lots, $12.12½; Electrolytic, 1 to 3 casks, $12.12½; carload lots, $12.00; Casting, 1 to 3 casks, $11.10; carload lots, $11.50. San Francisco: $15.15. Mill copper plates, $17.15; bars, 26@20c. London: £49 per ton.

LEAD.—New York, $4.00; Salt Lake City, $3.50; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £10 10s 0d per ton = 2.18 cents per lb.

SPELTER. — New York, $4.35; St. Louis, $3.95; London, £16 10s per ton; San Francisco, ton lots, 5c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

IRON.—Pittsburg, Bessemer pig, $16.00; gray forge, $15.00; San Francisco, bar, 2.60c per lb., 2.65c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $27.00; open hearth billets, $29.50; San Francisco, bar, 7c to 12c per lb.

TIN. — New York, pig, $22.50; San Francisco, ton lots, 27c; 1000 lbs., 27½c; 500 lbs., 27¼c; 200 lbs., 27½c; less, 28c; bar tin, ℔ lb, 32¼c.

PLATINUM.—San Francisco, crude, $19 ℔ oz.; New York, $20.50 per Troy oz

BISMUTH.—New York, ℔ lb., Subnitrate, $1.50; San Francisco, $2.50 to $2.75 ℔ lots.

QUICKSILVER. — New York, $51.00 large lots; London, £8 17s 6d; San Francisco, local, $48.00 ℔ flask of 76½ lbs.; Export, $45.00

MAGNESIUM.—New York, $2.90 ℔ lb.; San Francisco, $3.75.

ZINC.—San Francisco, 5½c; slab, 5¾c; bar, 7c; zinc dust, N. Y., 6c.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 18c; San Francisco, Plumbers', 100-lb. lots, 15.25c.

NICKEL.—New York, 50@60c ℔ lb.

PHOSPHORUS.—F. o. b. New York 50@60c ℔ lb.

FERRO-MANGANESE. — Pittsburg, 80%, domestic, $53.50, large lots.

TUNGSTEN.—New York, ℔ lb., 95c; San Francisco, $1.15.

POWDER.—F. o. b. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¼c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 30@31c ℔ lb.; carloads, 28@29c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2¾@3c ℔ lb.; blue vitriol, 5¾@6¼c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 6c; alum, $1.90@2.00; flour sulphur, French, 2¼@2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.00; sks, 95c ℔ 100 lbs.; chloride of lime, spot, $2.50@2.60; nitrate of potash, in kegs, 8c; caustic potash, 10c in 40-lb. tins.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $7.00; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $8.50; Colorado Anthracite, $14.50. Coke, $16 per ton in bulk; $18 in sacks.

OILS.—Linseed, pure, boiled, bbl., 74c; cs., 79c; raw, bbl., 74c; cs., 78c. Deodorized Stove Gasoline, bulk, 14¼c; do., cs., 20½c; 86° Gasoline, bulk, 20c; do., cs., 26c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 13½c; do., in cs., 19½c; Lard Oil, Extra Winter Strained, bbl., 75c; cs., 80c; No. 1 bbl., 50c; cs., 55c. Neatsfoot Oil, coopers' bbls., 60c; cs., 65c; No. 1 bbl., 50@52½c; cs., 55@57½c.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING DECEMBER 31, 1901.

690,127.—TELEPHONE-F. W. Alston S. F.
690,005.—PREPARING PRUNES—Anderson & Swink, San Jose, Cal.
690,234.—DENTAL APPLIANCE—H. C. Baghy, Santa Maria, Cal.
690,359.—DRILLING BIT—A. B. Burt, Redlands, Cal.
689,013.—CORK FOR BOTTLE — D. Chambers, San Jose, Cal.
690,100.—FLUID COMPRESSION—A. E. Chodzko, S. F.
690,021.—TERRET—F. H. Ellers, S F
690,144.—SAD IRON—C. F. Grubbs, Portland, Or.
689,874.—BOOK BINDING—F Hager, Portland, Or
690,238.—EXTRACTING GOLD — W. F. Heathman, Santa Ana, Cal.
690,304.—STOP MECHANISM—F. T. Leilich, S F.
690,305.—SEWING MACHINE—F. T. Leilich, S. F.
690,085.—PLOW—A. F. Maulhardt, Montalvo, Cal.
690,310.—COFFEE POT—J. A. McBride, Elko, Nev.
690,177.—LOOM SHUTTLE—J. H. Northrop, Tustin, Cal.
690,078.—PRESSURE REGULATOR—P. H. Reardon, S. F.
690,375.—AGITATING MACHINE—G. Rubsch, Jr., Los Angeles, Cal.
690,081.—SLIDING DOORS — D. Schuyler, Los Angeles, Cal.
690,328.—HARROW—J. Smith, Tekoa, Wash
690,204.—LADDER — Strauss & Johnson, Seattle, Wash.
690,085.—TOOTH CROWNS—J. F. Twist, S. F.
690,089.—UNLOADING APPARATUS—G. P. Wetmore, S F.
35,499.—DESIGN—A. Heunisch, S. F.
35,518.—DESIGN—A. W. Miller, Riverside, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

HARNESS TERRETS.—No. 690 021. Dec. 31, 1901. F. H. Ellers, San Francisco, Cal. The object of this invention is to improve the terret or ring which is attached to the pad or saddle of harness through which the driving reins pass, so that the rein can be easily introduced or removed at any part of its length without the necessity of pulling the ends through. The terret has a portion of its periphery cut away provided with sockets, and balls with spring pressure behind them normally close the opening. If the edge of the rein is pressed against the balls they will separate and allow the rein to pass in or out, but the pitch of the edges of the opening is such that the rein will not come out of its own action.

BOTTLE CORK.—No. 690,013. Dec. 31, 1901. D. Chambers, San Jose, Cal. One-half assigned to S. Chambers and B. F. Kent of same place. The stopple may be made of cork or any suitable material and has parallel holes extending through it and a recess in the top. A wire staple passes through these holes and through a washer in the interior, which washer presses against the bottom of the cork when the loop of the wire made exterior to the cork is pulled upon. This loop may be normally concealed within the central recess in the top of the cork.

VESSEL UNLOADING APPARATUS.—No. 690,089. Dec. 31, 1901. G. P. Wetmore, San Francisco, Cal. This device is designed to unload barges or vessels. It consists of a series of compartments having discharge chutes with controlling gates and an endless traveling carrier located beneath these compartments and near the bottom of the hull of the vessel. Either of the compartments may be discharged by means of a gate and the carrier will transfer the material to the end of the vessel while it is raised by an elevator and delivered upon the wharf or any other desired point.

APPARATUS FOR FORMING SEAMLESS TOOTH CROWNS.—No. 690,085. Dec. 31, 1901. J. F. Twist, San Francisco, Cal. This invention is designed for the formation of seamless tooth crowns from caps of thin metal, such as gold. It consists of an interior die having the shape of both the cusp and the lateral surfaces of the crown upon which the crown is fitted and an exterior two-part die of the same shape within which the interior member and tooth crown are placed. In conjunction with this is a mechanism by which the two parts are braced together and the crown is shaped to conform therewith.

APPARATUS FOR PREPARING PRUNES.—No. 690,005. Dec. 31, 1901. W. C Anderson and J. L. Swink of San Jose, Cal. Assignor to Anderson Prune Dipper Co. of Santa Clara, Cal. This invention is designed to prepare dried prunes and like fruits by subjecting them to steam or hot water. It consists of two horizontally journaled concentric cylinders with an intermediate spiral conducting blade, means for admitting the material to one end and discharging it at the opposite end. These cylinders are journaled in a suitable containing tank, so that the fruit in passing through them may be submerged in the water or subjected to steam if desired. The discharge end has radial divisions, and there is a receiving cone with ribs upon its surface which delivers the fruit from the end of the apparatus. The buckets are fixed on the outer head of the cylinder projecting to variable distances, so that the fruit is evenly and gradually discharged as the cylinders rotate.

CONTINUOUS COMPRESSION OF FLUIDS.—No. 690,100. Dec. 31, 1901. A. E. Chodzko, San Francisco, Cal. This invention is designed to compress fluids either liquid or gaseous in a continuous operation. It consists of a series of revoluble shells with suitable inlets and vanes revoluble with the shell which act to direct the fluid toward the periphery. Within the periphery are fixed collecting scoops which receive the fluid and transfer it to the next succeeding device, where the pressure is to be increased by successive devices. Receivers are interposed between the centrifugal machines so that fluids such as air may be compressed from the first machine into the receiver from which it is prevented from returning by check valve, and the next centrifugal machine taking the air or fluid from the receiver at the pressure therein will discharge it into another receiver at an increased pressure from which a third machine may take it and so on until any desired compression has been obtained.

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CALIFORNIA STATE

MINING AND SCIENTIFIC PRESS.

Whole No. 2165.—VOLUME LXXXIV. Number 3. SAN FRANCISCO, SATURDAY, JANUARY 18, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Fine Gold Placers.

There is really no especial difficulty or mystery about saving placer gold. The real difficulty consists in finding the deposit containing sufficient fine gold to make it commercially worth while to try to save it. It may be accepted that no apparatus or process that has been devised, or can be devised, will commercially recover absolutely all of the gold in the material treated. There are mechanical limitations which make such commercial recovery always approximate. The loss may be trifling but it is always something.

What gold there may be in a placer deposit is nearly always measurable by well understood methods of prospecting and estimating. The point of danger to the theory applied, is in carrying its application too far. By this is meant that the ground actually prospected can be estimated with fair accuracy, but the mistake is common of assuming that the prospecting prospects more ground than it as a fact does. This ground that is assumed as prospected, estimated as if it was, occasions that too frequently noted discrepancy between the prospectus figures of a placer mining proposition and the subsequent actual results. The common explanation is to make a scapegoat of the gold saving apparatus. It is accused of not saving the fine gold, and not being able to talk back it usually is made to carry the burden of the failure. The real explanation is that there was originally no gold to be saved.

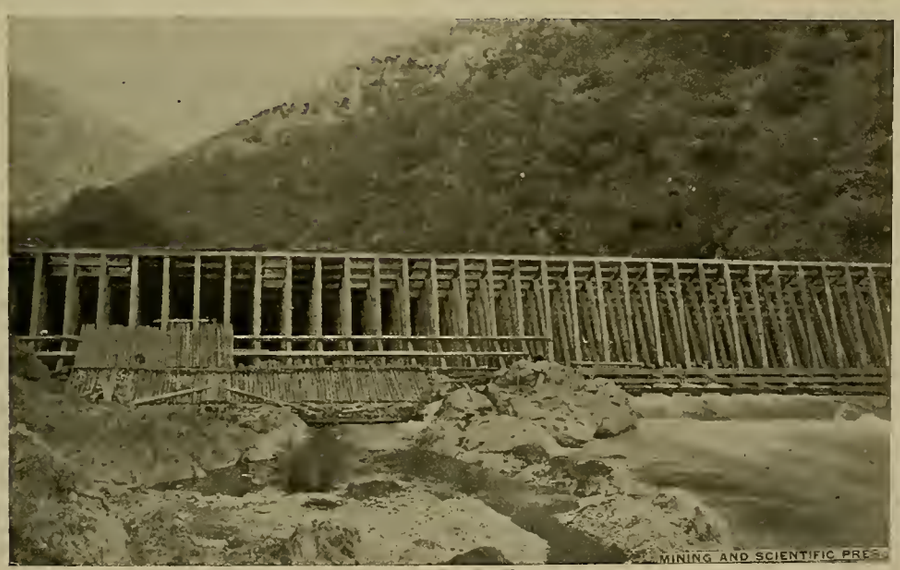
The prospectus was an unconscious misstatement. The writers of such papers always believe what they say to be true. They simply mislead themselves as to the facts, which look simple when they are not. These errors of preliminary estimation of placer deposits are much more common where the gold is fine than where it is coarse. With coarse gold you have it or you do not have it. There is not much room for averages or estimation between extremes. With fine gold in a placer deposit more is trusted to the imagination. True, this will be resented, honestly, but it is nevertheless the fact.

Fine gold is likely to be spread over much more area of ground than coarse gold. It is not always concentrated at the bottom of a deposit. It is not always superimposed over contiguous coarse gold placers or bedrock concentrations. It is, however, almost invariably in place concentrated into beds or layers between very much thicker beds or layers that contain commercially no gold at all. These bed concentrations are not coextensive with the entire "wash" deposit, though the prospecting may tend to give this idea. They are areas of former stream-flow bed, where the bed did not remain long fixed but was continually shifting its place in its own stream-drift accumulations. These changes would leave uneroded areas of the bed containing concentrations of fine gold, of more or less limited extent. The accident of time has made them possible placers. All the temporary beds, however, do not make such accumulations. The time element at the period of formation determines this very largely. Examples of this characteristic occurrence of gold-bearing gravels, which can readily be identified as being the fragmentary remnants of the temporary bed of the old stream, are common in the older placers of California. The miners termed them "upper leads" or "top wash." The great depth of the gravel deposits made the separation of the superimposed beds very plain, where in the shallower recent deposits it is overlooked.

The entire superficial area of a "wash" is therefore never commercially gold bearing, and only a small fraction is. The accidents of time and erosion may have made some of these fine gold bearing beds become the present surface. To prospecting they will prove richer than the ground underneath, but the prospector rarely estimates that way. He usually considers that the surface of "wash," if payable, indicates greater riches beneath at the bedrock. This easily leads to self-deception in estimating the depth of the placer deposit. The accident of a number of surface prospects, scattered at random or with system over a considerable area, giving payable returns, also leads to an incorrect estimation of the surface extent of the minable placer ground. These prospects are considered as if they were prospects of the same deposit or bed, whereas they may be, and often are, from several different beds of gold bearing ground with large areas of worthless ground between.

The methods of prospecting applied to determine the value of possible dredger ground in the United States are refined enough to miss these common errors of estimation. Taking a full section each time clear from surface to bedrock, and taking many such sections close together, the chances of error are eliminated. The danger to which attention is called, is the risk that values are overestimated where the old methods of panning the surface and edges of a "wash," and trusting the imagination for the quantities, are employed. It pays to be thorough in prospecting fine gold placer deposits. There is no magic in the distance of a prospective placer from the miner and there should be no mystery. The same exact methods that eliminate the imagination should be applied to estimate the placers of distant lands as are applied to those near at hand.

Benton Mills Dam After Completion.—(See Page 32.)



Benton Mills Dam, Mariposa River, Cal., During Construction.—(See Page 32.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 4 50

Entered at the S. F. Postoffice as second-class mail matter.

J. F. HALLORAN.....Publisher.

San Francisco, January 18, 1902.

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On another page the figures of some of the mine operations at the Lincoln mine on the mother lode, at Sutter Creek, Cal., are exceedingly interesting and instructive. Supt. E. C. Voorhies would seem to have made a world's record for cheap shaft sinking, and, in making it, given to California mining the lead in low mining costs that it has had for many years in low milling costs. The amount of powder used in this shaft work indicates ground of average hardness, and the labor cost per foot of sinking indicates an excellent quality of work by the miners. Taking into account the size of the shaft opening, the rate of progress and its costs are not very different from what they would be for tunnel work in the same kind of ground, which is exceptional practice.

The rain and snow fall in southern Oregon and in California are up to the date of this writing much less than usual at this period of the season. In ordinary seasons there would be several feet depth of packed snow at elevations of 5000 feet in the Sierra Nevada mountains. At the present time there is no snow on the ground at all at 7000 feet elevation. The water supply for mining will almost certainly be short this season, particularly where dependence is wholly on the direct run-off. Reservoir supplies are less likely to be short. The early seasonal rains of October and November gave the reservoirs so good a start toward filling that the late rains are sure to fill them. The snow that will probably yet fall before April will melt rapidly through not being packed and frozen down. The season of high water in the rivers will come early this year, but it is exceedingly improbable that it will last long.

Marble deposits have been receiving considerable exploitation on the Pacific coast during the last two years. The success made by a company operating near Spokane, Wash., first called attention to the market for this stone in the western third of the United States, with the result that many more quarries have been worked in Washington, and later discovered deposits in Idaho, New Mexico and on the Prince of Wales archipelago of Alaska, are being opened on a considerable scale. For some of the deposits strong claims are made as to quality, that if sustained as exploitation continues, will build up more than a purely local industry. The development of the modern type of fire-proof building construction, using marble very largely for interior work, has enormously increased the market requirement. The late improvements in stone quarrying and working tools and machinery have made a great reduction in the cost of production. Profits have been very satisfactory and it seems reasonable to anticipate that they will remain so.

The Marketing of Silver.

Silver has declined in sale price in even figures 10 cents an ounce since the beginning of 1901. At this time of writing the lowered price seems due rather to a lessened demand for it as a money metal than to a diminished use in the arts. China has taken less silver than in former years and it has obtained what it has taken from sources of supply less distant than the United States. Australia has settled part of her debit balances to Europe and the United States by credits for silver shipped direct to China. It cost less for transportation, and used up less time during transit, taken from Australia, than the charges would have amounted to if shipped from the United States.

The lines within which trade in commodities and money is conducted leave much narrower margins for profit than formerly. The trade in silver is not an exception to this tendency. Dealers in the metal understand this fully. The men who mine it have in the past paid little attention to the subject. It is, however, quite an important matter, particularly with the lessened profit in the business. The consumers of silver, referring by this particularly to the Chinese and Eastern peoples who hoard it, do not pay the costs of transportation of the metal to them. The dealers or middlemen charge all these costs and their own compensation to the producers. The number of middlemen the metal may be handled by, though obscuring the nature of the transaction, does not really change it.

The greater quantity of silver produced in the United States reaches its marketable shape as fine bullion in the western third of the country. While the silver consuming arts have their present industrial establishments almost entirely on the Atlantic coast, the same tendency toward reducing costs, that has already moved the centers of iron and lead manufacture into finished commodities westward to the mines, and is now moving the manufacture of copper commodities westward, will eventually move the silver art industries out where the mines are. This change will, however, be slow, unless, as suggested by this journal, the miners themselves become the manufacturers. But these conditions have no force whatever in dealing with the real price-making market, the money demand of the Chinese and other Eastern silver-hoarding races. Here, it would appear, is an opportunity for the silver miners of the West to get back some of the profit they have lost by the lowering of the price.

It should be perfectly practicable for the money trade in silver with the Orient to be put on the shortest time and distance route from the producer to the consumer. This would make San Francisco, and not New York, the natural silver market of the United States. New York is double the distance and time from the silver mines that San Francisco is.

San Francisco already is the natural smelting and refining center for silver ores from the greater area of silver-producing territory of the United States and countries bordering on the Pacific. It should be the smelting and refining center for all the silver exports to the Orient. New York costs of smelting and refining, which include transportation from the mines, are necessarily higher than at San Francisco.

New York is double the distance and time of San Francisco from China, the great consuming market. The price quotations of silver in New York and San Francisco are exactly the same. It would appear from this that so far as the silver miner is concerned there is no choice between the two points as a market. There is, however, a commercial difference. San Francisco being the nearest point to the mines and the nearest to China, the difference in actual costs must be in its favor, and there must, therefore, be a larger margin in commercial cost charges. These charges on silver bullion are interest on the gold value while in transit, insurance while in transit, and freight. The first two are directly proportionate to the time intervals and the last to the distance. The silver miners, however, are not compelled to accept this commercial situation as a finality. They can, as other mining industries are doing, carry their own insurance risks. They can save the difference in interest direct. Freight is a less simple problem, though not an insurmountable one. England and Germany own most of the ships that carry silver from New York, but New York owns most of the ships that would carry silver from San Francisco.

The matter is quite worth the attention of silver miners. No one of the money differences is large, but the aggregate of them all is a large sum. It will be a larger sum in the future, when the exploitation of China is well under way.

Definition of "Mining Claim."

The meaning of the term "mining claim," as used colloquially and as used in mining law, is not identical. The term, as commonly used, is not the equivalent of "mining location," but, in the construction of the mining statutes by the courts, a single location is regarded as a claim. The question of the exact meaning has been raised with reference to placer claim locations. The law limits the location of an individual locator to twenty acres, but permits associations of locators up to eight in number to make in one location a claim of twenty acres for each. Lindley, on mines, says of the legal requirements of assessment work on such placer claims:

"A location by an association of persons, embracing more than twenty acres, may undoubtedly be perpetuated by the performance of the same amount of labor required of an individual locator. Work need not be done on each 20-acre tract of a location embracing 160 acres made by such an association. But the appropriation by eight persons of 160 acres is accomplished by one location. While this suggests an inequality of burdens, it is in our judgment the only consistent method of construing the statute. A lode claimant or an association of persons may locate a full claim of 1500 feet in length. A location of less than the maximum would not decrease the burden as to the annual work. The volume of work is not gauged by the size of the claim located. There is no sliding scale adjusting the matter according to area. In determining, therefore, the amount of annual work to be performed in connection with an aggregation of locations, each location is to be construed as a claim within the meaning of the law, regardless of the superficial area comprised in any one or more of them."

The reported buying of the New Caledonia nickel deposits by the United States Steel Co. calls attention to the absence of extensive deposits of high-grade nickel ores in the United States. New Caledonia ores, as they are hand-sorted at the mines for shipment, run about 7% nickel. Such deposits as have been found in the United States carry from 1% to 4%, the latter being exceptional. So far as known, none of the deposits, with the possible exception of that at Riddles, Or., which is quite low grade, are very extensive. It has not been noted that they would justify the construction of special reduction plants. It is possible the lack of development will explain the supposed small extent of the known deposits. There has been little inducement to develop them. The ore taken out could not be sold to pay the cost of the development work. That the business of nickel mining in New Caledonia and Canada has been profitable is well known. The United States Steel Co., the largest single consumer in the world, has found it cheaper to buy the richest known deposit in the world than to continue paying the profits to the monopoly which has fixed the price of the metal during the last few years. New Caledonia is half the world around in distance from the consumers in the United States. Even with sailing ships, the metal, if brought in the ore to the United States, will have a transportation cost against it of 8 cents a pound. It is possible this may be lessened somewhat by reducing the metal in the mines at New Caledonia. Still, there would be a margin of transportation cost against the distant supply point that may be sufficient to compensate the penalty of lower grade ore and more limited deposits in the United States. The possibilities of nickel production in the United States are certainly potential enough to make their consideration worth while. Possible mines should not be overlooked, and there is certainly a place or an opportunity for the inventing metallurgist. So much has been done for the cheap metallurgical reduction of low-grade copper ores, with attention concentrated on it as a result of large profits, that it would seem as if a corresponding advance might be made in the cheap reduction of nickel from low-grade ores.

Concentrates.

ASBESTOS is one flexible substance that electricity will not burn.

ONE of two locators being an alien jeopardizes only the alien rights.

AN ore containing 1% of gold would assay 291.6 ounces gold to the ton.

THE cost of refined sheet platinum in San Francisco is 5 cents per grain.

HUNGARIAN RIFFLES are sawed slats set in the bottom of a frame that exactly fits into the bottom of the sluice.

FINE dry coal dust is just as dangerous as coal or petroleum gas, and will explode with equal force under the same conditions.

ANTIMONY as an alloy of aluminum gives it hardness and elasticity, but alloyed with copper it destroys all the good qualities of the latter metal.

A CUBIC FOOT of stiff clay will weigh 135 pounds; of sand, 95 pounds. The "angle of repose" for the first named material is 55°, for the sand 30°.

THE deepest shaft in South Africa is the Catlin, near Elandsfontein, 8x28 feet, 3754 feet deep. At Turfontein the diamond drill struck the "reef" at a depth of 4800 feet.

TO STEEL an axe, first cut the old blade off, then split the axe open, take 1 inch of square steel, forge down and weld on, then shape up, grind and temper. It is cheaper, however, to buy a new axe.

REGARDING gauge of track, the gauge is the distance in the clear between rails. A "3-foot gauge car" is one adapted to a track with rails just 36 inches apart; the wheels would measure 35½ inches between flanges.

SOME mining is being done in all the countries on the west coast of South America by American companies and methods. It is not advisable for American miners to go there except under contract with some company.

WEIGHT FOR WEIGHT, there is not much difference in the fuel value of petroleum of different gravities, the average estimate of the fuel value being that about three and one-half barrels oil equal one ton of good bituminous coal.

IN a calm, quiet atmosphere coal dust or petroleum gas will lie upon the ground or at the bottom of any vessel, but by walking among it or by agitating it in any way it mingles with the air and a flame will ignite and explode it.

A MINING LOCATION made on unsurveyed public land is valid. A valid homestead settlement can not be made on unsurveyed public land, according to a land office decision in the case of Henry vs. Delano in the Oregon City, Or., land district.

"CONCENTRATES" does not know of any case where the fumes from a chloridizing furnace are condensed to recover the volatilized gold and silver, though as a metallurgical proposition apart from any commercial profit the idea seems feasible.

ZINC DUST is used in the cyanide process for precipitating the metal just as zinc shavings are used. Experience shows rather less zinc consumed when the dust is used and there is a somewhat less quantity of aurocyanides requiring refining.

ONE CUBIC FOOT of petroleum weighs fifty-five pounds, 1 cubic foot of solid coal weighs eighty pounds, 1 cubic foot of loose average coal weighs fifty-six pounds, 1 cubic foot of sea water weighs 64.312 pounds, 1 cubic foot of fresh water weighs 62.4425 pounds.

THE velocity of steam does not vary directly with the pressure. The velocity of steam at 180 pounds gauge pressure is 1969 feet per second, and at 100 pounds 1876 feet per second. The theoretical velocity of water at 100 pounds pressure is 122 feet per second.

"FLASKS" or bottles to hold quicksilver can be used over and over again. They are usually made of boiler iron and weigh about 14 pounds each. A gallon of mercury weighs 136 pounds. A flask holds 76½ pounds. A cubic foot of mercury weighs 849 pounds.

"SECOND-FEET" is the discharge of water in cubic feet per second; 1500 second-feet means a flow of 1500 cubic feet per second. This multiplied by 3600 (the number of seconds in an hour) gives 5,400,000 cubic feet per hour; that divided by 100 gives 54,000, the flow in miner's inches.

THE real genius of the inventor is his ability to work, his patience and industry, his perseverance under adverse conditions. But the man who "throws out ideas" and says or thinks "the rest is a mere matter of detail," will never produce anything of consequence. It is in the "detail" the whole thing lies.

GLACIERS have undoubtedly had a great deal to do with the breaking down of mineral veins and the distribution of surface ores and metals. The operations of glacial ice have been moving on the most gigantic scale, vast quantities of vein material having been liberated and spread out by such action.

AS TO the number of board feet in a stick of timber 4x4 inches at one end and 8x8 inches at the other, the stick being 24 feet long, there are two ways of arriving at a correct answer. Add the areas of the two ends to four times the area of the center section and multiply by one-sixth of the length; or, multiply the areas of the ends and extract the square root; to this add the areas of the two ends, and multiply by one-third of the length. The answer by either process is 74⅔ feet.

BLIND VEINS apexing within the side lines of prior locations are excluded from the grant of veins discovered, made under a tunnel site location. The tunnel run by virtue of a tunnel site location has no right of way through such blind veins. The preceding is the rule established by the United States Supreme Court in the case of the Calhoun G. M. Co. vs. Ajax G. M. Co.

A MAN can do what he pleases with the bank of the stream which he owns; but if he diverts the course of the stream or narrows the waterway to the injury of an owner on the opposite bank or elsewhere, the latter party has his remedy in an injunction or a suit for damages. This system works fairly well, so far as damages due to the action of streams at their ordinary stages are concerned.

ANYONE claiming a forfeiture of a mining claim for failure by former owners to perform annual labor or improvements as required by Section 2324 R. S. U. S., has the burden of establishing such forfeiture, and an allegation of failure to perform $100 worth of work on the claim in any year is not sufficient, since the making of improvements on the claim to that amount would be equivalent.

A CIRCULAR MIL, as the term is employed to measure the cross-sectional areas of wires used in electrical work, is .7854 square mil, the mil being .001 inch. The electrical resistance of a wire 1 foot long and having one circular mil cross-section area, being known as the result of experiment, the electrical resistance of another wire of the same metal and different cross-section is readily calculated.

IN the absence of any special agreement otherwise, an invention made by a member of a partnership is the exclusive property of that member, and the patent when granted belongs solely to him. Even if the funds for prosecuting the application for the patent, making experiments and the like were paid by the partnership, that fact does not make the invention or patent partnership property.

WOOD ASHES can be used to assist in keeping amalgamated table plates in good working condition where the mill is not run nights. After shutting off the power at night and brushing up the plates, wood ashes freely sprinkled over them, and wet to form a paste, can be left on them till morning. The potash of the wood ashes cleans the plates of all grease and tends to soften and liven up the amalgam.

BORAX GLASS, powdered common window glass or bottle glass, in the proportion of two to one, is a good flux for aurocyanides. The glass should be powdered to 40 mesh. The proportions should be varied to suit the proportion of zinc, etc., contained in the aurocyanides. No soda should be used. The slag will not be free from gold and silver, so the slag should be remelted with lead or shipped to the smelter.

AN applicant at a U. S. land office to secure timber must swear to a non-mineral affidavit. He must take oath that he knows the conditions of the land at that time by personal observation; that the land is not occupied by any person or persons; that there are no mining claims, lodes or mineral deposits to his knowledge on said land. Coal, salines and coal oil claims on a tract of land exclude it from entry as timber land.

GOOD SOLDER is easier bought than made, but if some distance from base of supplies buy block tin and cut it up into about one pound pieces, weigh it and put in an equal weight of lead. Melt in a ladle, stir it and run it off into a mold to cool. To test solder and find out whether it is of good quality, hold it up near your ear and bend it. If you can hear it cringe or a crackling noise it is good, and if not it is poor—too much lead and not enough tin in it.

THE cessation of an advertisement in a popular and well circulated journal indicates to the public: 1. Either that the firm has quit business or is closing it up. 2. Or have found their goods unsalable in competition with better advertised and better pushed goods, and, therefore, withdrawn from the general market. 3. Or the firm has lost enterprise or got into a rut, any of which diminishes public confidence and also makes buyers distrustful of liberal or prompt treatment.

THE manner in which the field coils of a dynamo are connected will depend upon the use for which the machines may be constructed, but in a simple type where the voltage is supposed to remain constant they are connected across the circuit in multiple with the armature. After a dynamo has once been operated there will remain in the iron of the fields a certain amount of magnetism called residual magnetism, which will be sufficient to induce electrical action when the machine is started.

A QUICK and exact method for the quantitative estimation of copper in pyrites by precipitation with aluminum and electrolysis is as follows: Two to five grammes pyrites are dissolved in aqua regia, the nitric acid evaporated off, and the residue redissolved in five cubic centimeters of dilute hydrochloric acid and ten cubic centimeters of water. The whole is washed into an Erlenmeyer, diluted to 100 cubic centimeters, and warmed with excess of sheet aluminum on the sand bath. When the solution is colorless, showing that all the iron oxide is reduced, the solution is filtered and the residue (copper and aluminum) is washed free from chlorine, the filter paper burned, and the copper and aluminum dissolved in nitric acid. The copper is then subjected to the ordinary electrolytic estimation.

IN firing with petroleum, if the fire should go out, as it sometimes does when water is mixed with it, the oil continues to spray onto the hot furnace, generating a gas. If you attempt to light the fire the gas will explode with violence. First shut off the flow of oil, then blow the gas up the smokestack, then you can light the fire with safety. Never venture near a barrel or other vessel which has the petroleum in it, with a naked light, as it is liable to have gas in it, and is more dangerous than when full of petroleum.

TONOPAH, NEVADA, ores are silica ores from a smelting point of view. They contain no iron, lead or lime. All of these have to be provided as fluxes to smelt these ores. Tonopah camp does not yield these fluxes nor the fuel required. The ores were considered smelting ores because the miners shipped them to smelters at first instead of shipping them to stamp mills for treatment by amalgamation. This latter method of reduction may be found efficient, and in connection with cyanide treatment of the tailings would recover a percentage of the values.

THE Crown Mountain G. M. Co., Dahlonega, Ga., sluices its ores by the use of electricity. Twelve miles from the point where the company operates its mill there is a waterfall on the Chestatee river. An electric power plant is there, a pumping station on the banks of the river at the foot of the mountain, and a 10-inch pipe laid to a reservoir on the summit, 560 feet higher than the mill station. The reservoir has a capacity of 750,000 gallons; the triplex pump, propelled by electricity, forces 1500 gallons of water per minute into the reservoir, furnishing abundance of water for sluicing the ores.

FAILURE to perform the annual assessment work on a lode location does not forfeit a mill on a millsite location that may have been located to be used in connection with the mining location. The two locations are distinct things. Either exists without the other. There is no law requiring assessment work on millsite locations or providing for forfeiture of improvements made on millsite claims. A valid millsite claim cannot be located on land that is subject to location as a mining claim. The improvements then that are made on a millsite claim can only be appropriated when abandoned or by an adverse patent granted to the land.

PETROLEUM expands or contracts 1% for every 20° difference in temperature. Petroleum gas alone will not explode. It takes one volume of gas to ten of air to explode it. Petroleum gas is heavier than air, therefore is always at the bottom. A jet of gas into an atmosphere of air would burn the same. One pound of petroleum fuel, heated and atomized by air in a marine boiler will evaporate thirty pounds of water, one pound of Wellington coal will evaporate eight pounds of water. Eighty gallons of petroleum occupies 11.7 cubic feet, about one-quarter the space of coal. Eighty gallons of petroleum at 5 cents is $4; one ton of Wellington coal, $9.50, a saving of $4.50 per ton.

A FOUNDRYMAN gives it as his opinion in melting scrap sheet brass that the addition of half an ounce of aluminum to a No. 18 crucible of metal is the right proportion for a mixture that is high in spelter. Such a metal will run fluid in all the molds. He says that, in order to obtain a nice golden brass from scrap sheet, one pound of spelter and an ounce of aluminum is a good condition to bring about the golden color. Some brass founders have a way of putting in this metal while the pot is in the furnace and letting it boil, while some add it just before pouring. When the aluminum is added just before pouring it takes a smaller quantity than when it is put in and allowed to boil.

IN the electrolytic manufacture of sodium a mixture is made of seventy-five parts by weight of potassium chloride and fifty-nine of common salt. This mixture is electrolyzed in the electric furnace in a wide, shallow crucible with a partition in the middle, which does not, however, reach the bottom. The electrodes are placed horizontally, and pierce the sides of the crucible at opposite ends of a diameter perpendicular to the partition. The cathode side of the crucible is kept cold by a current of water. The anode is a solid carbon rod, and the cathode is a metallic tube, the axis of which is level with the surface of the fused mixture in the crucible. The sodium, which only contains about 1% of potassium, is removed through this tubular cathode.

MEN frequently make mistakes in the purchase of even the best and latest style of machinery, and are obliged to make changes in order to better adapt them to their business. In such cases the machine or machines can not be classed as second-hand in the true meaning of the term. For instance, a man may purchase a steam boiler and engine of the latest style rated at a certain power; but after a few months he may find it necessary to make certain changes and additions to the plant that will require much more power than the engine and boiler is capable of affording, and a change for one of greater capacity is required. But in such cases there is no necessity for making a large sacrifice or of putting it on the market as second-hand machinery. In such cases a liberal arrangement can always be made with the manufacturer for an exchange of one of larger size and greater capacity. The fact of a machine having been used but a few months under such conditions is no reason why it should not be purchased by another and smaller plant, where the power would be amply sufficient.

The Benton Mills Dam, Mariposa County, Cal.*

Written for the MINING AND SCIENTIFIC PRESS.

The Mariposa Commercial & Mining Co., operating the mines of the Mariposa grant, in Mariposa county, Cal., to supply their plants with electric power have heen preparing to use some of the water power of the Merced river, which flows across the grant. A portion of the works constructed by the company consists of what is known as the Benton Mills dam, huilt in the Merced river, ahout 30 miles helow Yosemite valley, at an altitude of 850 feet. It is about 100 yards ahove the bridge where the main county road from Mariposa to Coulterville crosses the river, and 150 yards above the site of the Benton mills, where at one time 120 stamps were dropping. It is located just ahove the site of the old dam which supplied the power for the mills.

All of the Sierra rivers have their high stages, when work in them is impracticable through the winter and spring and very nearly through the summer months. The Merced river is pretty well south of the region of maximum precipitation and there is, ordinarily, a season of low water a little longer than for the more northern streams. Last year was an exception and high water continued, so that work on the dam in the river did not commence till July 14. For several weeks after this time, while the cribbing foundation was heing put in, the stream flow exceeded 6000 miner's inches (22 cubic feet) per second, heing about three times the quantity of the ordinary minimum flow of this river.

The method employed in making the construction is as follows: A wing dam of sacks and dirt and rock was run out from the south bank of the river, turning the water into the north and middle channels, and the foundation cribbing and toe were put in place and finished, with the exception of a section of the top 4 feet of the toe planking, ahout 30 feet long, which was left open to allow the water to run through. Very little trouhle was experienced with water in this part of the work, all the seepage through the wing dam heing handled very easily hy a 10x6x10 duplex pump.

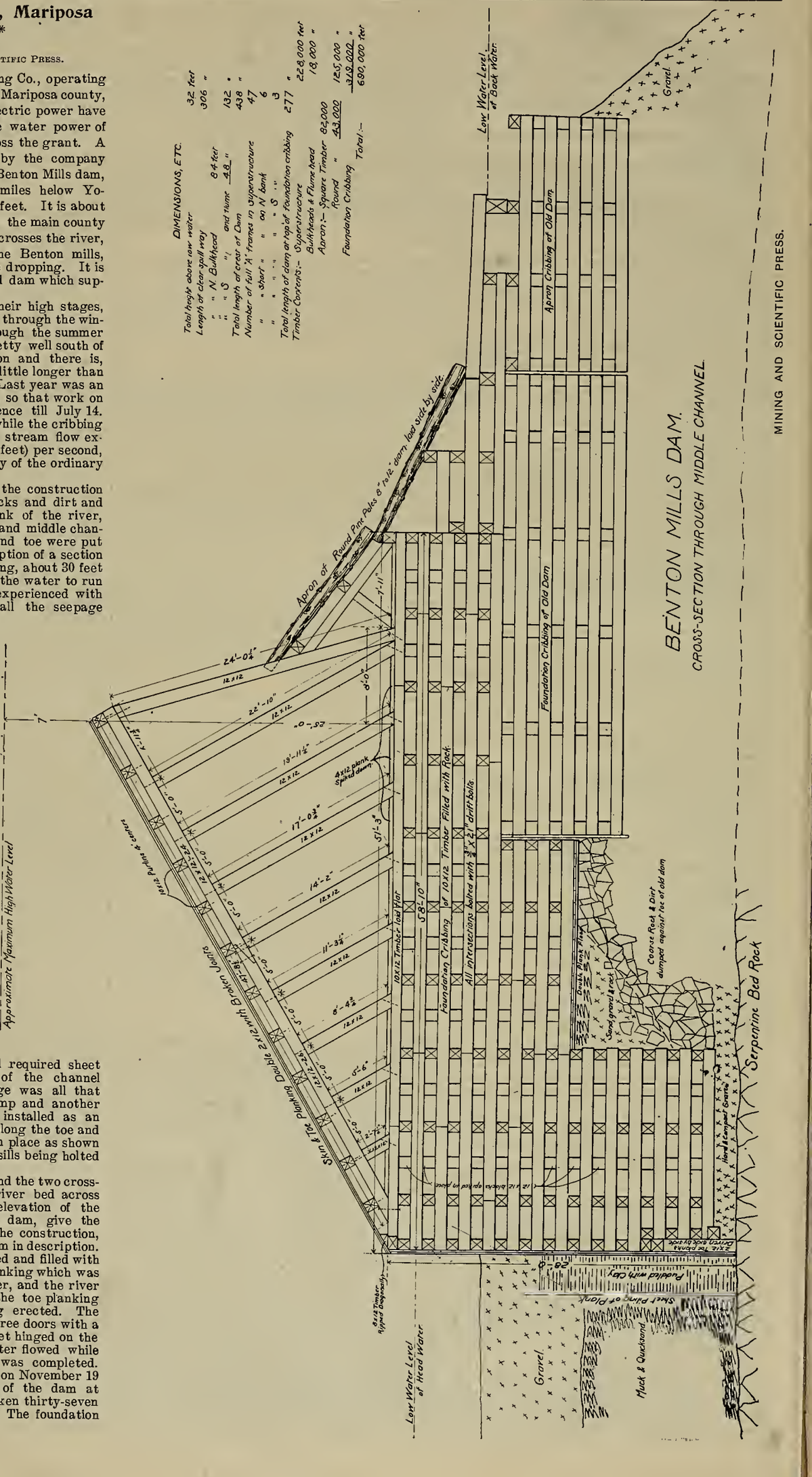
A wing dam was then run out from the north hank of the river, turning the water into the middle and south channels, and the hedrock in the north channel was stripped, a wing dam having also heen thrown across the channel helow the site for the foundations to keep out the hack water. More water was encountered in this channel, necessitating the use of a 6-inch discharge Jackson centrifugal pump, helted to an 8x10 horizontal engine. Work was delayed several days at this point (August 2) hy a sudden rise in the river due to a cloudhurst in the mountains ahove Yosemite valley which washed out some of the up-stream wing dam. The toe planking on this section of the foundation cribhing was omitted for a length of 36 feet and a depth of 4 feet to allow the water to pass through while work was in progress in the middle channel.

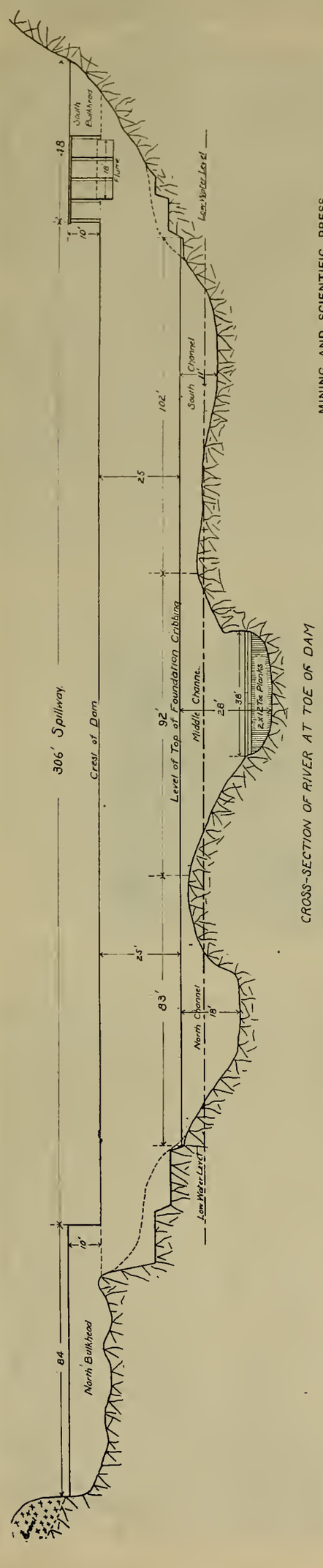
It was in the middle channel that the greatest difficulty with water was encountered. Progress was made very rapidly through the 8 feet of gravel first encountered, hut the underlying quicksand required sheet piling driven across the bottom of the channel as closely as possible, and the seepage was all that could he handled hy the 6-inch pump and another 5-inch centrifugal pump which was installed as an auxiliary. Bedrock was stripped along the toe and the planking and cribhing were put in place as shown in the cross-section of the dam, the sills being holted to the sides of the channel.

The two views on the front page and the two cross-sections accompanying this, the river bed across which the dam was huilt, and the elevation of the cribhing and "A" frames of the dam, give the dimensions and principal details of the construction, making it unnecessary to repeat them in description.

The foundation cribbing was finished and filled with hroken rock and gravel, the toe planking which was omitted was spiked on under water, and the river was allowed to run over the top of the toe planking while the superstructure was being erected. The planking was nailed on, leaving three doors with a width of 36 feet and a height of 8 feet hinged on the upper side, through which the water flowed while work on the skin and abutments was completed. The doors were closed at 5:30 P. M. on November 19 and the water flowed over the crest of the dam at 7 A. M. Novemher 21, it having taken thirty-seven and one-half hours to fill the dam. The foundation

* See illustrations on front page.


BENTON MILLS DAM.
CROSS-SECTION THROUGH MIDDLE CHANNEL.
MINING AND SCIENTIFIC PRESS.
DIMENSIONS, ETC.
Total height above low water 32 feet
Length of clear spillway 306 "
" " N. Bulkhead
" " S. " and wing 84 feet
Total length of crest of Dam 132 "
Number of full "A" frames in Superstructure 438 "
" " short " " on N bank 47
" " " " " S " 6
Total length of dam at top of foundation cribbing 3
Timber Contents:— Superstructure 277 " 228,000 feet
Bulkheads & Flume head 18,000 "
Apron:— Square Timber 82,000 125,000 "
Round " 43,000 318,000 "
Foundation Cribbing Total:— 690,000 feet
Low Water Level at Back Water
Gravel
Apron Cribbing of Old Dam
Apron of Round Pine Poles 8" to 12" diam. laid side by side.
Foundation Cribbing of Old Dam
Approximate Maximum High Water Level
4x12 plank Spiked down
Double plank floor
10x12 Timber load Plat
Foundation Cribbing of 10x12 Timber Filled with Rock
All intersections bolted with ¾" x 21" drift bolts
Coarse Rock & Dirt dumped against toe of old dam
Double Plank Floor
Sand gravel & rock
Hard & compact Gravel
Serpentine Bed Rock
Skin & Toe planking Double 2"x12" with Broken Joints
Puddled with clay
Sheet Piling of Plank
Muck & Quicksand
Gravel
Low Water Level at Head Water



CROSS-SECTION OF RIVER AT TOE OF DAM

MINING AND SCIENTIFIC PRESS.

cribbing was started by laying the longitudinal sills in cement on bedrock and bolting them down with 1x42-inch anchor bolts, 6-foot centers. This was carried out throughout except in the bottom of the middle channel, where the construction plan was as is shown in the sketch, the foundation cribbing of the old dam being used where available. This was all that there was of the old dam, the portions in the south channel being torn out and that in the north channel having been washed away years ago.

The foundation cribbing is all 6-foot centers, with the longitudinal sills reinforced by blocks in the spaces between. The "A" frames are also 6 feet center to center. The details of the construction cost account are as follows:

LABOR.			
Carpenters, laborers, etc	$15,381 13		
Superintendence, surveying, etc	281 28	—$15,662 41	
MATERIAL.			
Lumber, 647,000 ft. mountain pine	$12,499 24		
Round timbers, 43,000 ft, board measure	750 02		
Bolts, nuts, washers, etc., 14,950 lbs.	627 87		
Drift bolts, ¾x21-inch, 6720 lbs	228 52		
Nails and spikes, 6800 lbs	264 26		
Cement, 101 bbls	537 60		
Wood, 121 cords	364 70		
Coal (blacksmith's), 5900 lbs	87 50		
Oil, packing, waste, etc	90 16		
Powder, caps and fuse	60 54		
Sundries	58 37	—$15,568 78	
PLANT.			
Tackle, tools, derrick, etc	$ 583 77		
Cars, rails, wheelbarrows, etc	289 69		
Pumbing plant (2 boilers, 2 engines, 2 centrifugal pumps, 5″ and 6″, piping, fittings, etc)	1,192 03	—$ 2,065 49	
		$33,296 68	

The water turned by the dam through the headgate shown in one of the views is carried 450 feet in a 5x16-foot box flume of ordinary construction to the power house, where it is used under a head of 25 to 30 feet (depending on the stage of the water in the river) to drive four McCormick turbines, direct connected to a 400 K. W., 3-phase, 7200-alternation Westinghouse generator, and also a 15 K. W. direct-current exciter, run separately by two 9-inch turbines. This plant will supply power to the mines on the grant, except for a short time in the summer, when it will be impossible to run the plant to its full capacity owing to scarcity of water.

For the data used herewith and for the diagrams and other illustrations the MINING AND SCIENTIFIC PRESS is indebted to the courtesy of Mr. Chas. C. Derby, manager of the Mariposa Commercial & Mining Co., and Mr. W. G. Britt, the foreman of the dam construction work.

Cost of Development Work.

The report of the Centre Star M. Co., of Rossland, B. C., for the year ending September 30, 1901, shows in full detail the cost of the development work done in the mine during the year:

	Sinking Main Shafts.	Sinking Small Shafts.	Raising.	Drifting.
Total advance, feet	337	50.5	324.5	2,107
COST PER FOOT.				
1. Drilling	$12 95	$7 61	$7 51	$5 43
2. Blasting	4 89	1 77	2 05	95
3. Explosives	3 91	3 39	3 27	2 81
4. General mine supplies	2 35	1 54	97	57
5. Mine lighting—candles	62	35	16	16
6. Mine lighting—electric	72	27	19	16
7. Smithing	1 05	1 18	96	69
8. Shoveling—direct	19 66	5 92	83	1 11
9. Shoveling—apportioned	1 54	55	48	46
10. Timbering—labor	9 60	1 23	3 05	17
11. Timbering—material	3 16	12	74	05
12. Machine drill fittings	1 15	1 23	1 02	64
13. General mine labor	7 81	4 33	2 83	2 11
14. Hoisting underground	14 28	7 27	....	16
15. Hoisting main shaft	2 19	92	71	65
16. Compressed air	2 03	1 36	1 54	1 07
17. Mine ventilation	1 29	81	47	33
18. Assaying	01	34	31	18
19. Surveying	59	24	23	17
20. General expense	9 41	4 50	3 70	2 29
Total	$99 21	$44 93	$31 02	$20 16

Fine Silver for the Year.

The monthly extremes of silver quotations for fine silver in the New York market during 1901 were as follows:

	Highbest.	Lowest.
January	64c	60⅛c
February	61⅝	60⅛
March	61¼	59⅜
April	60⅜	58½
May	60	59⅛
June	60	59¼
July	59⅛	58⅝
August	58¾	58⅛
September	58½	58⅛
October	58⅛	57⅛
November	57⅜	54⅞
December	55¼	54

Advanced Methods of Electric Precipitation.

Written for the MINING AND SCIENTIFIC PRESS by J. H. JORY.

In 1894 an article appeared in the MINING AND SCIENTIFIC PRESS relating to the "electrolytic sluice," a process then in its crude form, and proposed principally for the electrolytic amalgamation of gold and silver. Though there was at that time in existence, by the same inventor, an apparatus and process of the same general character designed for the electrolytic deposition of gold, silver, copper and other metals from streams of flowing solutions, this was probably the first practical process devised for that purpose.

Since that time there has come into use in Australia and South Africa an electric method of gold and silver precipitation from cyanide solutions, known as the Siemens-Halske process.

The existence of a process similar to that of Siemens & Halske, but which the writer believes is an improvement on that method, has not heretofore been introduced to general notice.

The electrolytic sluice, to which reference has been made, is an apparatus of a very compact form and comprises a number of metallic plates set in a rectangular box, the plates being nearly vertical and adjustable to very close proximities.

These plates are so electrically connected as to provide, alternately, anodes and cathodes throughout the series, the fluid to be treated passing into the sluice above the electrodes, then through the narrow channels between the electrode plates, where the metallic contents are deposited, and then into the launder below, where it passes off to be again used as a further solvent in other operations. A simple mechanism is provided to adjust the vertical angles of the electrodes, and, at the same time, to increase or diminish their proximities while maintaining their parallel relations.

A sluice containing sixty-five plates, each plate having about 2 square feet of surface, is capable of depositing the precious metals from 1000 tons of solutions per day with the expenditure of about 2 H. P. of electric current. There is considerable latitude in the conditions that may be observed, so that a much larger quantity than that above stated may be passed through the apparatus in the given time, if containing lower values, or the flow may be retarded when the metallic contents are greater.

The adjustment of the powers of deposition to the amount of metal to be deposited may be made by raising or lowering the current density on the electrodes, by increasing or diminishing the flow of solutions, or by increasing or lessening the proximities of the plates.

Thus a perfect control may be had to secure a thorough extraction of the precious metals and, at the same time, to exercise all necessary economy of current, which, if uselessly expended, leads to waste of cyanogen, as well as power.

The plates forming the electrodes, although easily removable for the purpose of removing the deposits, are made to be permanent parts of the apparatus, but should be in duplicate, so as not to interfere with the continuous working of the solutions. A few moments only being necessary to take out the plates and substitute the duplicates, and the manner in which the proximities of the electrodes may be adjusted to allow for the thickening of the deposits, enabling the work to continue for long periods without removal of the plates, makes the process practically a continuous one.

The electrodes are made of such metals as are best suited to the solution treated, and are selected to secure the smallest amount of corrosion possible of the anodes and a good conducting power of the cathodes, with surfaces that may be so treated that the deposits may be easily removed. Graphite offers some advantages in both these directions; but it is preferred when treating cyanide solutions to use iron as the anodes and copper for the cathodes of the process, the iron being treated to prevent erosion and the copper receiving a treatment that, though not preventing metallic deposition, yet allows the deposit to be easily taken from the plates.

As the capacity of this sluice, as stated, is at least ten times greater than that usually employed in the Siemens-Halske process, contains less than one-tenth of the electrode surface and demands no greater electric current, a reference to well known electrolytic laws and the presentation of some figures seems necessary to show that the results obtained are mainly owing to differences of construction and adjustments, and that the agencies employed in the electrolytic sluice are ample for the greater results obtained.

In similar electrolytes flowing between similar electrodes there are three conditions tending to increase or diminish the relative rate of deposition: 1. Current density. 2. Relative mass through which the current acts. 3. Proximity of the electrodes. When all other conditions are alike, the proximities of the electrodes and the relative mass are the conditions exerting the influence of the relative rate of deposit, provided sufficient current

density exists on the electrodes to produce deposition at the higher rate.

Now, if we have a flow of solutions between electrodes of 1 inch proximity, and having a rate of deposit of one grain per minute, and reduce the proximity to $\frac{1}{10}$ inch, we increase the rate of deposition ten times, by reason of the greater proximity, and ten times by reason of the lesser relative mass between the electrodes, so that we obtain a more rapid rate of deposition in the ratio of 10×10 (or 100 times) to 1 : or, as the relative mass is always decreased in the same ratio as the proximity is increased, we may say that the rate of deposition from a flowing electrolyte, when there exists ample current density on the electrodes, and ample metallic elements in the solution, is in inverse proportion to the square of the distance between the electrodes. So, therefore, it is possible that while by one method of adjustment only one grain will be deposited in one minute, another system may produce a deposition of 100 grains in the same period.

Now, taking Faraday's well known electro-chemical laws of deposition, whereby certain fixed densities of current produce, under proper conditions, certain fixed weights of metallic deposit, we will say, as being near the case, that one ampere of current exerted for one minute will deposit one grain of bullion composed of combined gold and silver.

Now, there is treated by the electrolytic sluice a flow of solution equal to the rate of one ton per minute, each ton containing 120 grains of bullion. This would require a current density, on the entire 64 square feet of cathode surface, of 120 amperes to deposit the whole 120 grains. But, possibly, there may be other reactions taking place in our apparatus which are unavoidable, such as the electrolyzing of a portion of the water, etc. For this we allow another 120 amperes, which gives as current expended 240 amperes at a tension, say, of six volts; this will equal 1440 watts, or about 2 H. P.

But we are yet largely within our powers, for a firm deposit may be produced with a current density of even five or six amperes to the square foot of cathode surface, while in our supposition we have employed but two amperes, and our flow has been at the rate of 1440 tons per day, while, if required, the flow may be diminished to one-half that rate. It seems to be generally overlooked that the thorough deposition of the metallic contents of a flowing solution does not altogether depend on the area of the electrodes as on the rate of flow of the solutions treated, but that it is the effect of an ample electric current properly imposed on electrode surfaces proportioned to the density of current required for the deposition of a given quantity of metal from a specific chemical solution brought under electrolytic control in a given time.

These conditions have been complied with in the electrolytic sluice to a larger degree than in the apparatus of Siemens-Halske; hence, the greater results obtained.

The processes of the electrolytic sluice may be applied to a number of purposes, and to those especially where rapidity and cheapness of extraction of any metal is required. A brief mention is here made of a few operations closely allied to those treated on above and coming directly within the scope of this article.

In the extraction of copper from low-grade ores, smelting may be impossible from its expense, as compared with the value of the metal obtained, or with ore of a higher grade the expense of treatment, combined with the cost of freight, may be prohibitive. It often occurs, under these circumstances, that by submitting the ores to roasting treatment, the insoluble sulphides may be cheaply converted into soluble sulphates which are easily leached, and the metal deposited from the solution, in the manner described in the gold and silver extraction processes, may be obtained so cheaply as to afford a good profit. The processes of the sluice are also valuable in the deposition of copper from such dilute solutions as may sometimes exist, as drainage from mines. In this case it deposits a pure copper at no greater cost than is incurred by the cementation method in producing a very inferior mixture.

As a means of deposition of silver from alkaline hyposulphite solutions this method also offers a cheap and rapid system of working, as compared with the chemical method of precipitation from such solutions, which occupies considerable time and occasions much loss in bringing the precipitate into the metallic form; while by the electrolytic method no loss is occasioned either in time or metal and the silver is produced in a pure state.

This method of treating silver is now being further extended by the discovery of more efficient solvents, by means of which silver ores containing but little lead may be worked without roasting. It is thought that these solvents may be so further improved that even lead-bearing ores may be treated by lixiviation without roasting, and that both the lead and silver may be recovered by electric precipitation. But, however this may be, the means afforded by the electrolytic sluice would seem to offer a means of relief to those miners having such silver ores not readily accepted by the smelters.

ROBERT BALL, professor of astronomy and geometry at the University of Cambridge, England, explained in a lecture on "The Cause of the Ice Age," delivered at Columbia University, New York, that the ice age was due to the influence of the planets Venus and Jupiter on the course of the earth's revolution around the sun and the change of orbit from a circle to an ellipse. He said also that there would be another ice age when Venus, Jupiter and the earth were in a certain position regarding one another. This, however, would not happen for several thousands of years.

La Fortuna Mine, Arizona.

[STAFF CORRESPONDENCE.]

Herewith is presented an illustration of La Fortuna mine and mill, Yavapai county, Arizona, owned and operated by C. D. Lane of California and associates. This property is in the Gila range, 16 miles south of Blaisdell station, on the Southern Pacific Railroad, and is a typical desert mine. The formation here is a limestone having a schistose structure, the bedding of the formation dipping southeast. The vein lies between strata of the country rock and has the same dip and strike. Between walls the ledge runs from 10 to 20 feet wide. The ore is a hard, white quartz, associated with quartz more or less broken by the decomposition of the pyritic minerals. It carries free gold, but no sulphides of any kind at the present depth of the workings. The free gold horns out and amalgamates readily, though apparently the ore contains a good deal that is flour fine, the saving of which depends upon the cyanide work.

A two-compartment incline shaft sinks on the vein to 1000 feet depth, with levels run on the vein from 100 to 500 feet each at the 100-foot stations. The mine has been worked about five years and a considerable portion of the ore has been stoped out above the seventh level. Most of the present production, however, comes from the stopes above the 500-foot level. The stopes are timbered up with square sets. In one of these, on the eighth level, a face of ore appears that stands about five sets high, running from wall to wall. A little below the eighth level the ore body was lost by reason of a break or fault in the formation. The incline was continued to 1000 feet, where a station was cut and prospecting levels and crosscuts run therefrom in search of the ore. From this 1000-foot level two incline winzes, pitching in opposite directions, have been sunk, each 200 feet deep, and the two connected at the 1200 by a 400-foot drift. The underground work in the mine aggregates at least 7500 feet.

Fortuna Mine and Mill, Fortuna, Yuma County, Arizona.

Two skips are operated in the main incline by a double-drum steam hoist, and a skip is operated in each 200-foot winze by compressed air.

The mill is equipped with twenty stamps, weight 1425 pounds each, dropping eighty-two to the minute, the material passing from the mortar through 50-mesh screens. Below the usual plates for amalgamating at each 5-stamp battery the pulp passes to a second system of similar plates on a lower floor. It is claimed that in this way 75% of the saving is made on the plates. The tailings pass to a pond at a lower level and are treated in a cyanide plant comprising five 150-ton leaching tanks and the usual rig for precipitation. The stamps mill about seventy tons of ore daily.

Ironwood timber is used for fuel and water for mill work, the cyanide tanks and domestic purposes, is pumped 16 miles through a 4-inch pipe to storage tanks near the mine. The well and pumping station are near the railroad. About ninety men are employed at mine and mill, besides a number in other work. F. J. Martin is Supt., H. C. Haupt assistant and J. Golden mine foreman.

Fortuna, Dec. 31, 1901.

Notes on Protection of Metal Work by Asphalt Concrete.*

By W. H. FINLEY.

About eight years ago the railroad company I am with had occasion to put in a bridge in the city of Rockford, Ill. The city insisted that the floor be made watertight, and I decided to put in a solid ballasted floor and to protect it by covering the troughs 2 inches deep with asphalt mixed with sand in the proportion of about 1 to 1. Recently it was necessary to renew the ties and the gravel ballast that was put in on top of this asphalt, and occasion was taken to make an examination of this asphalt covering. The California asphalt used did not contain coal tar or any of its products. There was found considerable life and elasticity to it after eight years of service. It was, in fact, almost as good as on the day it was put in, and the trough was absolutely as dry and well preserved as on the day it was put in.

I thought, in view of the fact that a number of bridges are being erected in the city, which it is necessary to make watertight, it would be of interest to some of the members to know of our experience with ballasted floor bridges protected with asphalt covering. We have, since the bridge in question was put in, used quite a number of ballasted floor bridges, using pure asphalt only, mixed with sand, and I am satisfied that it is entirely practicable to protect an ordinary ballasted floor bridge so that there will be no deterioration of the iron or steel. This particular bridge has been absolutely watertight during all these years. It is situated over Main street, in Rockford, Ill., and if there was any leakage we would have heard of it very promptly.

I believe all the asphalt compositions used in Chicago contain either coal tar or its products, and in cold weather the concrete cracks and permits the entrance of water between the covering and the iron, with a consequent rapid deterioration of the iron.

I have found, in my experience in applying asphalt to metal bridges, that it was absolutely necessary to have the iron clean as far as grease and dirt are concerned, and that in no case should the iron be damp, cold or chilled. If hot asphalt is put on iron, wood or stone where there is any moisture, it will peel off and will not adhere, so that, in all cases where it has been applied in cold weather, we have had to beat sand and spread it over the iron work to take out the chill. In summer time the sun is usually hot enough to heat the iron, and artificial heat is not necessary. In one case, where we had to take up a subway covering that leaked, we found that it had been applied without first drying off the stone. After the covering was removed, the stone and metal work was cleaned and heated and a new covering of asphalt put on.

The cost is not excessive. Of course, after you have once made up your mind as to whether you will put in a solid floor bridge or an open floor bridge, the extra cost of this protection is a small amount compared with the total cost. There is no question but that the solid floor bridge costs more than the open floor bridge. I am inclined to think that from now on we will see more solid floor bridges than in the past. Unquestionably there is a great saving in maintenance on all small structures. They do not require a bridge crew, as the ordinary section man looks after them. The asphalt was found adhering to the iron-work. It was quite difficult to remove, even with a cold chisel; practically no pressure was put on in applying it; it was put on very much as you would put on an ordinary street paving of asphalt. We first cleaned the iron off as well as we could. We then spread hot sand over the iron to warm it, and then painted over the exposed surfaces with pure California asphalt; then we put in this composition of sand and asphalt and ironed it out with a hot iron.

*Journal of Western Society of Engineers.

Solutions.

By A. A. Watson.

When we put a piece of sugar in water, what becomes of it? It dissolves. But what is solution? It is not a mere mixture of fine particles, for if we take a microscope and examine a drop of the solution of sugar we do not see any small particles of sugar. So far as can be seen, the water is as clear as before, yet we know hy the sweet taste of the liquid that the sugar is there. It is in solution. What the condition of solution is has not even yet been placed heyond dispute, hut the theory which has obtained the greatest amount of credance is that the particles of a solid, when placed in a liquid in which it is soluhle, keep getting smaller and smaller, until at last they are separated into their molecules. These molecules in solution are then in the same condition as the molecules of a gas. They are separated from each other, they influence the vapor pressure of the liquid they are dissolved in, and they exert a pressure on their own account which is sometimes very considerahle and can he accurately measured. Another theory which has some supporters is that solutions are composed of the dissolved suhstance with the solvent. It has heen pointed out that when sulphuric acid is mixed with water heat is evolved, proving that a chemical compound is formed. No douht this is true in this particular case, and the prohahility is that the first theory is wholly, and the second partially, true. To understand the solution of a solid in a liquid it is necessary first to understand the state of solution of gases in gases. Gas mixes in all proportions. Their molecules are free and ahle to move ahout in any direction. If two gases are hrought together they continue to mix until a uniform mixture is ohtained. If we take a flask full of heavy carhonic acid gas and invert a flask full of hydrogen over it, taking care that the openings of the flasks are fitted tightly to each other, in a few days carhonic gas will he found in the upper flask and hydrogen in the lower, although hydrogen, until a few years ago, was the lightest gas known to science. The molecules of gas are always in a state of rapid motion, and therefore when two gases are brought together the molecules of one soon penetrate those of the other and in time complete mixture is the result.

Gases are generally soluhle in liquids. Their soluhility depends upon pressure and temperature. The greater the pressure on the gas, and the lower the temperature of the liquid, the more gas will he dissolved. In the liquid condition, however, the molecules are closer together than in the gaseous condition, and for this reason the solution of a gas in a liquid is not so complete as the solution of a gas in another gas, and the thicker the liquid the less gas it will absorh. Mercury, for example, which is nearly solid, ahsorhs very little of any gas—indeed, so little that the quantity is difficult to measure.

Liquids, like gases, dissolve each other, hut to not nearly the same extent. The molecules of a liquid are nearer each other than those of a gas, and not so free to move ahout. For this reason some liquids will not mix at all, or only to a very slight degree. Ether and water, for example, will not mix, and neither will water and petroleum. Water and alcohol, on the other hand, mix completely.

Having considered the solution of gases, a case in which the molecules are widely separated, the solution of gases in liquids where the molecules of the gases are free, and in the liquids only partially so, and the solution of liquids in liquids, where the molecules are only partially free, we come finally to the solution of solids in liquids, a case in which the molecules of the one are partially free, and of the other tightly packed together. It is needless to remark that the soluhility of solid suhstances in liquids is very limited. Metals, however, dissolve in some acids, and many organic substances dissolve in water and other neutral liquids. When a layer of water is placed over a soluhle salt, the salt hegins to rise against gravity and to diffuse in it, the motion only ceasing when the suhstances are uniformly distrihuted throughout the whole mass of water. This motion may be arrested hy bringing hetween the solution and the solvent a septum which will let the solvent through, but not the dissolved substance. A semi-permeahle wall of this kind can he prepared by saturating a porous earthenware cell with a solution of copper sulphate, and then filling it up with a solution of potassium ferro-cyanide. A precipitate of copper ferro-cyanide is formed on and within the earthen wall through which water, hut not sugar solution, can he filtered. If we fill such a cell with sugar solution and connect it with a marometer to measure the pressure, and place it in pure water, we obtain an increase of pressure. A solution of sugar of 1% gives a pressure equal to 50 cms. of mercury. This pressure is called "osmotic pressure," and the laws governing it are the same as for gases, the pressure heing proportional to the concentration of solid in the liquid. It has been found hy calculations based upon the molecular weight of sugar, that the osmotic pressure of a sugar solution has the same value as the pressure that the sugar would exercise if it was contained as gas in the same volume as is occupied hy the solution. This is an important point and sheds a light upon the condition of solid suhstances in solution.

Solids, when dissolved in liquids, lower the freezing point proportionally to their molecular weight. For example, if a suhstance called A has twice the molecular weight of another substance called B, an equal weight of A will lower the freezing point of a liquid twice as much as an equal weight of B. The vapor pressure of a liquid is also lowered according to the same rule when a solid suhstance is dissolved in it.

When a compound of a metal with an acid, as, for example, sodium chloride or zinc chloride, is dissolved in water, not only are the fine particles of the salt resolved into their molecules, but these molecules themselves are resolved into their primary elements. It has heen found that the osmotic pressure and the lowering of the vapor pressure and freezing point of water, where metallic salts are dissolved in it, are twice as great as expected from the molecular weight of the salts. From this it follows that there must be twice as many molecules, and, therefore, instead of one molecule of zinc chloride, there must he one molecule of zinc and one of chlorine. Another proof of this fact is that if we evaporate a solution containing sodium chloride and magnesium sulphate slowly, at ordinary temperatures, sodium sulphate and magnesium chloride separate out instead of the original salts. From this disassociation of metallic compounds into their elements in solution we get our galvanic hattery. When a solution of copper sulphate is made the sulphur, combined with oxygen, disassociates from the copper; now when a piece of zinc is placed in the solution, the zinc begins to combine with the sulphur oxygen, to form zinc sulphates copper precipitates, and when a circuit is made a galvanic current is evident.

We see, therefore, that the solution of a solid in a liquid is a continuous process of extremely fine division, the process heing continued down to the molecules themselves, and, in the case of metallic salts, down even to their primary elements.—The British Columhia Mining Record.

Oxygen and Hydrogen Gases by Electrolysis.

The production of oxygen and hydrogen gases hy the electrolysis of the water of solutions of caustic alkali has now become a successful suh-branch of electrochemical industry, and at Rome, Milan, Zurich, Lucerne, Hanau, Brussels and Paris installations of this kind are in operation. Several different forms of apparatus have heen devised for carrying out this decomposition of water and separation of the gases liherated. A recent one, the Schuckert electrolyzer, consists of a cast iron tank containing a large number of iron hells, one of these latter heing used to cover each electrode and to collect the gas liherated at its surface. A 15% solution of caustic soda is used as electrolyte, and a continuous inflow of distilled water is required to replace that decomposed hy the electric current. The hest efficiency is ohtained with this apparatus at 70° C. (126° Fah.) with an electromotive force of 2.8 volts, and in order to guard against loss of heat the electrolyzer is emhedded in a wooden hox filled with dry sand. Ruhher tubing is used to conduct the gases from the "bells" to the gas holders, ruhher heing used to prevent short-circuiting hetween the latter and the cell. A Schuckert electrolyzer of normal size is 26 inches in length, 18 inches in hreadth and 15 inches high, and requires for charging 13.20 gallons of sodium hydrate solution. With a current of 600 amperes this electrolyzer produces per hour 7 cubic feet hydrogen and 3.5 cuhic feet oxygen, measured at 15° C. and 30 inches pressure. Using power costing 1 cent per kilowatt hour, oxygen and hydrogen would cost together ahout $1.30 per 1000 cuhic feet. The cost of compressing either gas for storage in cylinders would double this amount, making the total cost to the user ahout $2.50 per 1000 cubic feet. The use of hydrogen gas, in gas engines of special design, as a motive power for automobiles, is likely to receive practical study, now that a supply of the compressed gas at low rates is at the command of engineers.—The Electrician.

Increasing U. S. Silver Coinage.

The House Committee on Coinage, Weights and Measures have reported favorahly a bill providing for the maintenance of the legal tender silver dollar at a parity with gold, and for the increase of the suhsidiary silver coinage. The bill authorizes the coinage of suhsidiary silver coin without regard to limit and as puhlic necessity may require. The most important feature of the hill for the parity of gold and silver dollars is as follows:

"The Secretary of the Treasury is hereby directed to maintain at all times a parity with gold the legal tender silver dollars remaining outstanding, and to that end he is hereby directed to exchange gold for legal tender silver dollars when presented to the Treasury in the sum of $5 or any multiple thereof; and all provisions of law for the use or maintenance of the reserve fund in the Treasury relating to United States notes are, in the discretion of the Secretary of the Treasury, herehy made applicahle to the exchange of legal tender silver dollars."

Some Mine Data.

In his report of the past year's work of the Lincoln G. M. Development Co., Sutter Creek, Amador Co., Cal., Supt. E. C. Voorhies gives some interesting data concerning mine costs. He says:

When we started to sink the shaft below the 1200 level we installed the Baby Giant drills, and the following is a comparison of cost hetween shaft sinking with power drills and hand drilling.

Cost and time for sinking 450 feet of shaft hy hand drilling from the 800 to the 1250 levels (dimensions of shaft 8x17 feet) was as follows:

Twelve miners, 304 days at $2.75 per day, eight-hour shifts	$ 9,424 00
One foreman, 304 days at $4 per day	1,216 00
Total cost of labor for sinking 450 feet shaft by hand drilling	$10,640 00
Average cost of labor per foot	23 64

Cost of sinking 477 feet of shaft with Baby Giant drills was as follows:

Nine miners, 208 days at $2.75 per day, eight-hour shifts	$5,147 00
One foreman, 208 days at $4 per day	832 00
One night foreman, 164 days at $3.25 per day	533 00
Premium given for extra work	94 50
Total labor cost for 477 feet	$6,606 50
The average cost per foot	13 00

The above figures include all the lahor of timbering.

Cost of lumber per foot of timbered shaft	$ 5 27
Cost of powder per foot of shaft	1 82
Cost of caps per foot of shaft	06
Cost of fuse per foot of shaft	16
Cost of candles per foot of shaft	34
Cost of extra parts for power drills per foot	36
Cost per foot of shaft not including power or top expense	21 96

In the month of June we installed an oil-burning apparatus in place of wood for fuel. We erected a 1200-barrel redwood tank 160 feet north of the hoisting works; and the same is connected with the hoilers with a 4-inch pipe line. The comparison hetween pine wood and Bakersfield crude oil for fuel during the year has heen as follows:

From January 1st to July 18th (six months, eighteen days), we hurned 602 cords of wood at $6 per cord, which would equal $3612.

From July 18th to January 1st (five months, twelve days), we used 1460 harrels of oil at $1.50 per harrel, making total cost $2190.

Average cost per month for wood	$547 27
Average cost per month for oil	404 55
Savings per month	$142 72

The following is a detailed statement of the work done at the mine from January 1st to Decemher 31st, 1901, showing the gallons of water, tons of waste hoisted, hlasting holes drilled, etc.

14,925,800 gallons (55,822 tons) of water were hoisted from the mine during the year.
9,953 tons of waste were hoisted from the mine during the year.
6,219 tons of water were hoisted from the mine during the year.
16,172 total tonnage during the year.
3,004 blasting holes were drilled in the different levels from Jan. 1st to April 1st.
2,810 blasting holes were drilled in the sinking of the shaft.
244 blasting holes were drilled in the crosscut for 1600 dam.
34 blasting holes were drilled in the repairing of shaft.
6,092 blasting holes were drilled in the mine during the year.

Seventeen thousand eight hundred pounds of dynamite, seventy-one hoxes of caps, sixty-three 40-pound boxes of candles and 49,100 feet of fuse were used during the year; 602 cords of wood were hurned from January 1st to July 18th; 1460 harrels of oil were burned from July 18th to December 31st. The compressor ran 2875½ hours during the year. The engineer made 40,338 trips with water, waste, timhers, men and empty skips. From May 1st to Decemher Decemher 31st ninety-five sets of timher, 400 feet of air pipe, 432 feet of compressed air pipe, 380 feet of permanent ladder and 450 feet of permanent track were put in place. Total distance of drifts and crosscuts run from January 1st to April 1st, 691 feet; 583 feet of diamond drill work was done during the year. Average number of men employed during the year, twenty. All the buildings, machinery and tools are in good condition. Rainfall from January 1st to December 31st, 1901, 20.06 inches.

Platinum in a paying quantity has heen discovered in the Dry Diggings District, Jackson county, Or. The metal occurs in small grains or flakes. Many placer miners in southern Oregon have found it in quantity in their sluices, but have thrown it away, heing ignorant of its identity and value. Serpentine, the rock source of the platinum, is a predominant formation in Josephine county, more especially in western Josephine. All the streams draining this section are platinum producers.

Process for Welding Copper and Steel or Iron.

For some time it has been the custom of providing sledges or hammers with copper faces which, being soft and yielding, do not injure the metal upon which they are used. A new method of putting these faces on the hammer has recently been discovered by Comley Bros. of Braddock, Pa., who patented it.

It is essential that the iron or steel before welding the copper or brass should be thoroughly freed from scale or rust, which may be done by any method in practice. The body portion of hammer or other tool to be united to the copper face being placed in a receptacle, such as a black-lead crucible, in which it may be subjected to the temperature in the fire or furnace, the body being properly covered to prevent the iron or steel from oxidizing. The receptacle or crucible is heated until the temperature of the iron or steel body is raised to nearly the melting point of the copper. At the same time a sufficient quantity of copper is placed in a vessel or crucible in the fire or furnace and melted. While in the molten state the scum or impurities are gathered. The copper being melted and the hammer body being now ready to be united, the two receptacles or crucibles are taken from the furnace and the hammer body is quickly removed from its enclosure, and that part which is to be welded to the copper is immediately plunged into or immersed in the molten copper. A small portion of lead sufficient to cause the copper to solidify is dropped into the crucible, or the lead may first be melted and poured into the vessel containing the molten copper, usually about one-fourth of an ounce of lead to one pound of copper. By putting the quantity of lead into the vessel after the hammer is placed in the molten copper the volatilization of the lead frees any sulphurous acid gas from the copper, and the copper is purified and solidified. Charcoal and sand or other heat-retaining medium may then be placed over the welded mass, so as to prevent too sudden cooling and allow the molecules of the two metals to unite more firmly. Thus covered the welded copper-faced body is allowed to gradually cool. As soon as the copper is solidified and cooled to the desired temperature the welded compound body may be removed from the crucible and at once rolled or shaped into any form or may be stacked for further treatment.

In making a brass or bronze face weld an alloy is prepared, which may consist of two parts tin, one part zinc, one part lead, and from two to fourteen ounces of copper. The zinc, lead and tin, melted and alloyed, are poured into the receptacle immediately after the hammer body is placed into the molten copper, and the whole may then be covered up with charcoal and sand or other heat-retaining medium.

In preparing the body portion of the hammer for welding to the copper face, the part to which the copper is to be welded is niched or roughened, so as to provide an irregular surface which will give the molecules of the copper and steel a better opportunity to lock and unite similar to the welding of two pieces of iron at the blacksmith's forge.—American Manufacturer.

A New Denver Mining Machinery Plant.

Herewith is illustrated the new plant of the F. M. Davis Iron Works of Denver, Colo., one of the largest manufacturers of mining and milling machinery between Chicago and San Francisco. About two years ago this company had a disastrous fire, completely destroying their old works. The plant as now rebuilt is modern in every respect, covering an area of about four acres, with a total floor space of over 70,000 square feet. The different departments are well equipped with the most modern machine tools, driven by electric motors and commanded by electric and pneumatic cranes. At present the company employs about 300 men, with a yearly output of over half a million dollars. Their product is exclusively machinery for the mining, milling and smelting of ores.

Machine Shop—Shafting Department.

Machine Shop—West Bay.

Machine Shop, 132 x 210 Feet.

Administration Building, Plate Steel Shops, Foundry and Pattern Shop.

Machine Shop With Twenty-Five Ton Crane.

Machine Shop—East Bay.

New Plant of F. M. Davis Iron Works, Denver, Colo.

Some Occurrences of Gases in a Quicksilver Mine.

Written for the MINING AND SCIENTIFIC PRESS by PHIL REARDEN.

While mining quicksilver ore in an old mine in California a short time ago, I noted some exceptional occurrences, and got enough gas experience to satisfy an ordinary miner, for a short time at least.

We were doing a lot of development in an old mine which had already about 7000 feet of levels and winzes. In the first case we drove a crosscut drift about 200 feet from a vertical shaft to cut the vein. We had artificial ventilation, a 16-inch fan with 10-inch galvanized iron pipe (supposed to deliver theoretically 1500 feet of air per minute at end of the pipe), which was always kept as near the breast of the drift as possible—ordinarily about 20 feet. The end of the pipe was protected by timbers when firing the shots.

In the country rock, which was sandstone and shale, we had no trouble, but when we struck the vein it was different. The vein matter was serpentine, in which occurred the cinnabar. The width was about 10 feet and it contained a large number of fissures and openings from the width of a knife blade to 6 inches. All these openings contained both water and gas; so, in addition to the gases, we were continually striking large flows of highly mineralized water.

The first shot into the vein brought a large flow of water and four kinds of gases, viz.: Carbonic acid gas, CO_2; inflammable marsh gas, CH_4; sulphuretted hydrogen gas, H_2S; chlorine gas. A combination of all called by the miners "sore eye gas," from the fact that after from four to six hours' contact with this gas their eyes were affected very similar to snow blindness, was very painful and took from two to four days from which to recover.

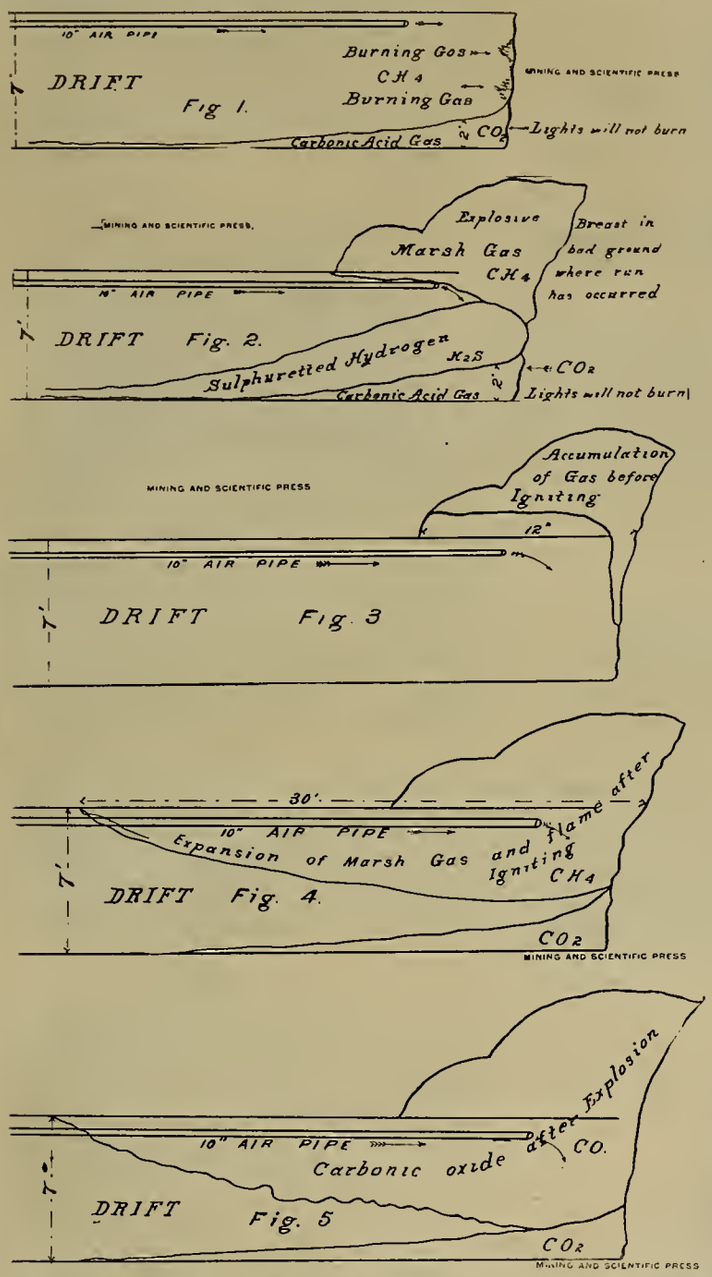
As there was a large amount of soda and sulphuric acid in the water, the result was an unusual amount of carbonic acid gas, which came with the water from the floor, the sides and the breast in such quantities, and being heavier than air, that no lights would burn within 2 feet of the floor at the breast, extending back 20 to 30 feet, and gradually disappearing along the floor and ditch.

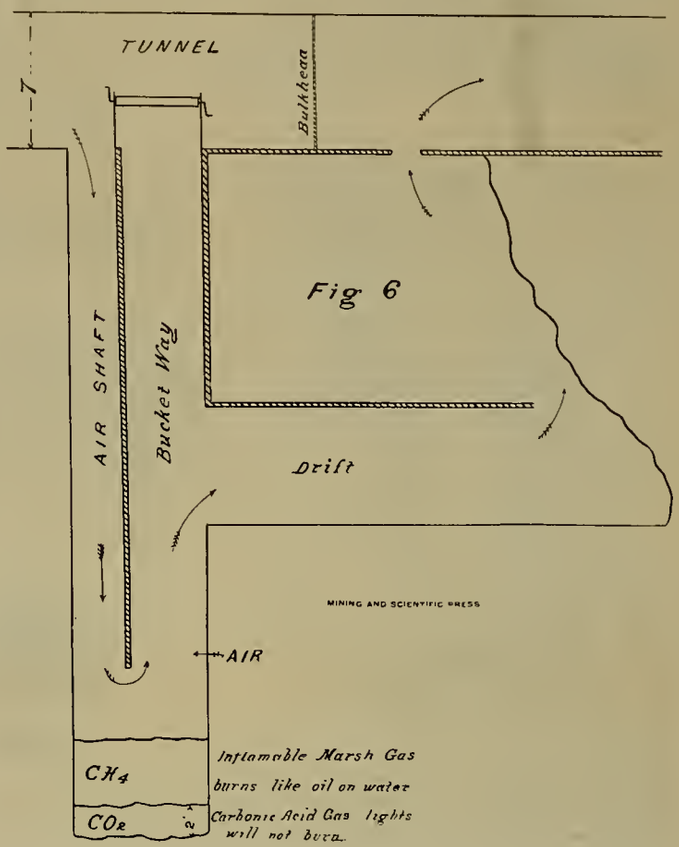
The next troublesome one was the marsh gas, which also came in with the water, and, being lightest, immediately raised to the top of the drift and formed in the cavities that would occur above the timbering along the roof. It came in such quantities that our air supply could not dilute it fast enough when in these cavities. The consequence was that we had to burn it out or explode it frequently to prevent its accumulating in large quantities and from exploding from contact with the lights—candles—when we were not prepared for it.

We also partially prevented large accumulations by keeping the gas lighted and burning where it escaped from the fissures in the breast. These were kept burning at all times; and immediately after firing a round of shots a miner would go back to the breast and hunt up the fissures and re-ignite them before any large amount of gas formed overhead. Imagine the consternation of a new miner when first he went in here to work on seeing these flames burning in the breast! Of course, we had some men pretty badly burned, the writer being one of them, but no serious accident occurred.

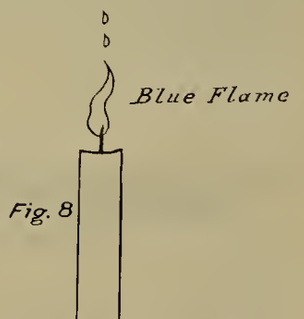
There being a large amount of sulphur and iron in the water, the result was sulphuretted hydrogen in quantities too large to suit, and, being semi-inflammable and also good for asphyxiation, was another menace; also, on account of its odor, was not at all desirable. The water, which was not hot, but of nice temperature for drinking, contained magnesia, salt, soda, sulphur, lithia, lime, iron, mercury, silica, niter and a lot of other elements too numerous to mention here.

See diagrams illustrating the actions of the gases in the mine. Fig. 1 represents the theoretical and actual condition in the level, showing flames or jets of gas burning in the breast and carbonic acid gas along the floor. Fig. 2 represents the theoretical condition where a run occurred in the mine and left a large cavity overhead, showing position occupied by inflammable marsh gas in top of cavity, next below the semi-inflammable sulphuretted hydrogen gas, and below that the carbonic acid gas along the floor. Fig. 3 represents the theoretical condition of a small body of marsh gas in cavity near roof before igniting or exploding. Fig. 4 represents the theoretical and real conditions of the expansion of marsh gas at instant of igniting or exploding. Fig. 5 represents the theoretical and real conditions of increase of carbonic oxide gas immediately after the explosion, consequently it was very unsafe for the workmen near the breast for some minutes after the explosions. Fig. 6 represents the theoretical conditions in a shaft or winze which we sunk from a tunnel floor, and from which we were underhand stoping at the side.

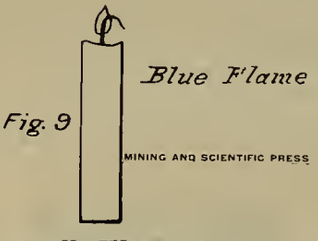




Candle Flame where no Inflamable Gas exists.



Candle Flame in presence of Inflamable Gas.



Candle Flame in presence of Carbonic Acid Gas.

There was a tight brattice in the shaft between the bucket and manways. This caused the air to pass down the manway and under the brattice, partially clearing the bottom of the shaft and passing

through the stope to the tunnel floor again and thence to other parts of the mine.

In this shaft the carbonic acid gas would form about 2 feet deep on the bottom and lights would not burn; but on top of it, and next to the current of air at the bottom of the brattice, there would form enough partially diluted marsh gas to burn when ignited for about ten minutes, just like oil on water. Two of the miners, while passing under the brattice, concluded to look into the bottom of the shaft, about 10 feet below, and one lowered his candle a little too far, the result being there was an explosion and both were severely burned.

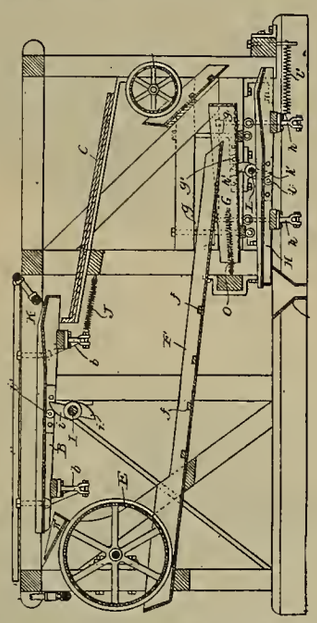
We found it necessary always before going into this shaft to work to burn out the gas by tying a rag saturated with kerosene to a wire and hanging it in the shaft.

Mining and Metallurgical Patents.

Patents Issued January 7, 1902.

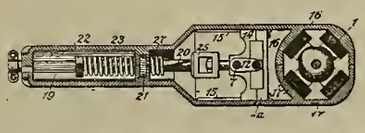
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

GOLD SEPARATING MACHINE.—No. 690,791; B. W. Sweet, Denver, Colo.



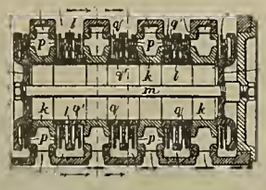
An inclined concentrating table, and means for operating it, amalgamating surfaces at each end of table for receiving heavier and lighter grades respectively, a lower inclined concentrating table, sizing screens located above lower table for separating out heavier grades and discharging lighter concentrates with a fall sufficient to submerge them on the lower table, means for operating lower table and screens, and means for discharging material passing from amalgamating surface which treats lighter grades into sizing screens.

ROCK DRILL.—No. 690,687; A. M. Ballou, Denver, Colo.



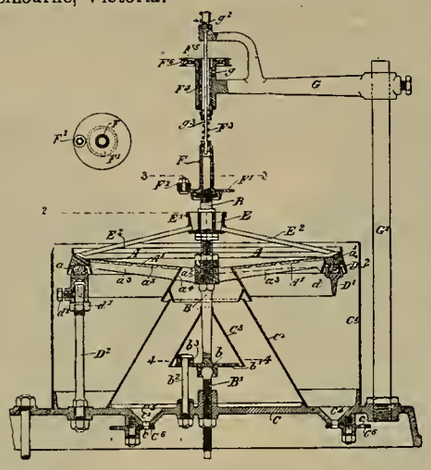
An electro-mechanical rock drill, consisting of a driving wheel 6, having holes, a disk provided with loose tapered keys and with springs holding keys in holes, a shaft, upon which wheel is loose and upon which disk is mounted with friction rolls for permitting rotation in one direction and not in other, a crank upon shaft, a plunger for holding a bit, a crosshead movable to and fro and connecting crank to plunger, means for rotating plunger during its longitudinal movement, a spring acting to drive out plunger and adapted to be compressed by turning of crank, a link 25 connecting crosshead to plunger, and a spring 27 in front of link to act as a cushion.

ARRANGEMENT OF VALVES FOR PUMPS, ETC.—No. 690,879; F. W. Rogler, Budapest, Austria-Hungary.



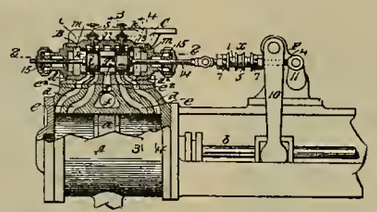
A casing, and partitions in casing having central openings therethrough; a series of disks fitting in openings, said disks having recesses in their peripheries, ports opening through their sides into recesses, collars between disks, stop disks on collars, valves arranged between ports and stop disks, and flexibly connected to latter, and means for binding disks and collars together.

APPARATUS FOR SIFTING PULVERIZED ORES OR THE LIKE.—No. 690,731; W. Jamieson and F. J. Odling, Melbourne, Victoria.



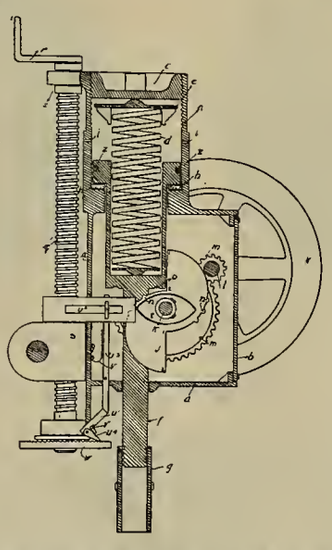
The conically dished sifting or sizing appliance A A′ provided with a central discharge a^4 and with a peripherical feed appliance, central spindle B provided with pivotal cup h and flange h′ at its lower end, weighted rotating disk F′ F^2, flexible shaft F^3, disk driving spindle F^4, dish seating cushion D supported in an adjustable ring D′, the spherical headed adjustable bolt B′, the holding bolts h^2, rubber washers b^3 between bolt heads and disk, and bed plate C.

STEAM PUMPING ENGINE.—No. 690,545; C. C. Worthington, Irvington, N. Y.



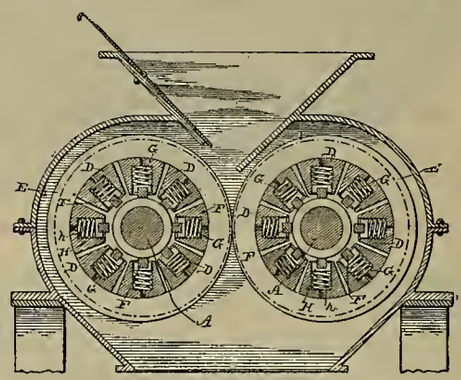
A duplex piston valve steam chest adapted to be secured to a duplex steam cylinder construction in place of a duplex D or other side valve steam chest and provided with separate admission and exhaust steam ports controlled by piston valves and adapted to register with and form extensions of cylinder steam ports and having dash relief valves controlling passages connecting admission and exhaust ports.

ROCK DRILL.—No. 690,630; A. C. Bates, San Francisco, Cal.



A machine casing having a front and a rear chamber, front chamber containing a main shaft and a cam wheel and gearing for movement of a balance wheel attached to countershaft, a plunger for working of a drill operating through same, plunger consisting of a shaft provided with a collar for holding a drill and having a recess in its rear end for holding a spring for driving plunger forward, plunger at the mouth of recess having a flange or head presenting a straight surface to inner sides of rear chamber and slidable against sides, front wall of rear chamber having an opening for operation of rear section of plunger therein and inner surface of wall being inclosed by expansible packing so as to prevent escape of compressed air from cushion thereof formed on release of spring, between lugs and packing opposite thereto, rear chamber having vents in its sides and rear wall consisting of a threaded cap adjusted to opening of rear chamber for shortening of spring as may be desired, in combination with a cam wheel having two parts for successively forcing back plunger compressing spring and suddenly releasing it, and having spurs on rim to act in conjunction with the pockets in plunger opposite thereto for turning it, a cam adapted to act upon and release a feed attachment provided with a pawl arranged to engage teeth of a ratchet wheel attached to a feed screw for forward movement of machine, feed attachment consisting of a centrally pivoted bar, a rectangular block having a slot, a thumb screw securing block to bar through slot bar having an angular branch and pawl being pivotally connected therewith.

CRUSHING MILL.—No. 690,534; T. L. Sturtevant, Quincy, and T. J. Sturtevant, Newton Center, Mass.



Two end heads C, C, having inwardly projecting peripheral flanges c, c, a circular series of weights overlapped by flanges, a series of pins or bars held in place by heads and engaging weights to retain them in proper position, a tire encircling weights which is loose relative to roll shaft, and springs for yieldingly forcing weights outward against inner face of tire to maintain weights normally in position to balance roll.

PROCESS OF OBTAINING METALLIC LEAD FROM LEAD ORES.—No. 690,520; A. Germot, Asnieres, France.

Blowing air through a mass of molten sulphide of lead containing silver or other metals, condensing without contact of external air fumes of sulphide of lead which separate from mass, introducing condensed fumes into a mass of lead or of lead and sulphide of lead containing no silver or other metals and blowing a current of air therethrough.

Revision of Mining Laws.

Senator Stewart has introduced the following three proposed amendments to the mining laws of the United States: One is to amend Chapter 6 of Title 32 of the Revised Statutes, so that the date of the expiration of mining locations shall be Oct. 1 of each year, instead of Jan. 1, and provides that where the annual assessment work has not been done the original locators can not relocate the ground without immediately commencing and prosecuting diligently to completion the required assessment work.

Another mining bill is designed to prevent the monopoly of mineral land by providing that no person shall locate a mining claim as agent or attorney for any other person, association or corporation. The third mining bill provides for the repayment to the miner or mining company of unexpended moneys to cover the costs of platting and office work in connection with the patenting of claims.

THE value of mineral products in the United States in 1900 exceeded for the first time the billion dollar mark, according to the Geological Survey report on mineral resources. The figures were $1,067,603,636, as compared with $971,900,894 in 1899, a gain of $95,702,712, or 9.85%. Iron and coal yielded over half of this total, their combined value being over $566,000,000. The most important gains in gold production were in the Seward peninsula of Alaska, the Cripple Creek district of Colorado and in Arizona. The yield for the year is valued at $79,171,000, a gain of $8,117,600 over 1899. The silver output was of the commercial value of $35,741,140. The crude petroleum production exceeded all records, the large increase being especially noted in West Virginia, California, Ohio, Indiana and Texas.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

JUNEAU.

The owners of the Boston King group of quartz claims at Salmon creek, near Juneau, have incorporated the Alaska King G. M. Co. to operate it. The group consists of eight quartz claims, upon which several thousand dollars' worth of work has been done during the past two years, consisting of a crosscut tunnel, drifts, dam, water flume and ditch, by which, with about 3000 miner's inches of water from Salmon creek, the surface has been hydraulicked to trace the lodes. In this manner two good lodes have been uncovered, one of which is 12 feet and the other 16 feet wide. The owners are J. Wagner, C. Goldstein, H. H. Folsom, L. Goldsberg and N. Wagner, all of Juneau.

The report of the Alaska United mine for the month ending Dec. 15 shows 18,455 tons ore crushed, of a value of $17,037, and 525 tons sulphurets, of a value of $17,737. Total receipts for the month, $38,810; expenses, $26,909. Average of ore, $2.10 per ton.

KOYUKUK.

Koyukuk advices state that a great stampede from Dawson and Nome to Koyukuk in the spring is indicated by miners from those camps who are rushing in this winter. B. Barton writes from Bettles City that gold is found at a depth of about 4 feet. The first stratum is gravel and then comes slate bedrock, where the paystreak lies. The wages range from $1 to $1 25 an hour, but almost every one is working for himself and it is hard to get help. Logs for houses are bought and sold for $6 each. There were only 150 people in the entire Koyukuk country last spring, but there are 300 now. There are four saloons, one bakery and two restaurants there. Flour is selling at $7 per sack, sugar at 20 cents per pound, caribou or moose meat at $1 per pound, overalls for $2 50, rubber boots at $15 a pair and tobacco at $2 a pound. There is a great scarcity of goods of all descriptions in the country.

NOME.

J. Gropper and E. Hamman of Seattle, Wash., last summer discovered tin in the vicinity of Cape York. They have bonded their claims to W. M. Curtis of Detroit, Mich. The proposition is said to be a placer one, the tin being saved by sluicing. It is proposed to ship the ore to the United States for reduction.

VALDEZ.

W. S. Amy of San Francisco, one of the late owners of the Bonanza group of copper mines in the Chisna district, states that the new owners will immediately begin the work of developing the properties and commence during 1902 the construction of the railroad from Valdez to the mines, a distance of 150 miles.

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—The property of the Black Diamond Copper M. Co. is on the eastern slope of the Dragoons, 9 miles west of Pearce. The group covers a mineralized ledge running with the trend of the range. It is well opened up through several tunnels, some of which are crosscuts and other going in on the ledge. Work demonstrates that the width between the walls is over 100 feet, within which are shoots of ore said to be about 20 feet wide. The ore consists of an iron and copper sulphide, which Manager N. O. Bagge states will run 5% to 7% copper, carrying also good values in silver. In fact, the mine was first opened and operated several years ago as a silver mine. The ore body is in a contact between lime and porphyry. Equipment is partly on the ground for the construction of a smelting plant, which will include a 44x120-inch furnace of 200 tons capacity, and a cupola furnace, 38 inches diameter, for resmelting the matte. These and other machinery are being furnished by the Allis-Chalmers Co. A 1½-mile aerial tramway will be erected to deliver the ore from the mine to the smeltor, there being a difference in elevation of 800 feet between the two. The necessary power plant will use fuel oil. The smelting plant will be enclosed in a 76x190-foot steel structure. Water will be conveyed to the plant through a 3½-mile pipe line from springs, which, it is claimed, will furnish an ample supply. The officers of the company are Frank H. Crockard of Wheeling, W. Va., J. G. Hearne, James A. McBain, N. O. Bagge and Frank C. Hoffman.

Pearce, Jan. 9.

F. Powers has sold his World's Fair mine, in the Harshaw district, for $50,000 to J. Brockman of the Commonwealth M. Co. of Pearce. The mine is reported to be one of the richest silver mines in Arizona. Large works, it is stated, will be erected on the property at once.

GILA COUNTY.

(Special Correspondence). — The Old Dominion Copper M. & S. Co.'s operations are now under the superintendence of F. W. Hoar. The smelting plant has three furnaces, one of which is in operation at present. Copper bullion and copper matte is produced. The latter is being held for shipment or resmelting. A tram line carries the ore from the mine to the bins above the bedding floor. Similar bins hold coke, lime and iron ore. The mine is on an ore body that trends east and west, lying along a contact of lime and diorite, the ores being found mostly within the lime. The property is worked through a 900-foot vertical shaft, the worked out ground being timbered with stulls and square sets. At the twelfth level is a pump. The water is discharged into a reservoir below the shaft, and thence is piped to the smelter. The ores from the Old Dominion include oxides, carbonates, silicates and sulphides of copper, though thus far the bulk of production has been carbonates, the sulphides having been struck at water level. Over the shaft is a 60-foot gallows-frame. The five boilers at the hoist and the four at the smelter use crude oil as fuel, storage tanks having been provided with which to carry a supply. One of these will hold 75,000 gallons. The lime and necessary iron oxide ores to mix with the copper ores are mined on the same property. The sulphide ores are not being smelted in large amount, but are being stored. The property is well equipped with machine shop, timber framing machine and storeroom.

F. D. Adams, manager of the Bobtail Mines Co. of Minneapolis, is developing a copper property on the southwestern slope of the Pinal range, 15 miles southwest from Globe. The group is made up of twenty claims and is opened by a 200-foot shaft, with levels run in on the 50, 100 and 200-foot stations. It is stated that there are 1500 tons of ore on the dump and 10,000 tons blocked out in the mine. The ore body is 2 to 5 feet wide. Plans have been made to erect a small concentrating mill, the ores being a sulphide, carrying gold, silver and copper values. A considerable tonnage of their sulphide ores will be hauled to the Black Warrior for use at acid plant. Mr. Adams is developing for the same company a gold property 1½ miles south of Ray, in Pinal county, where he has driven a 150-foot tunnel, a 50-foot winze and a 40-foot drift from the latter. It is claimed the ore here runs from $19 to $700 per ton. The work exposes a considerable tonnage that may be stoped. A 2-stamp mill, capable of handling ten tons a day, is en route to the property.

Globe, Jan. 11.

GRAHAM COUNTY.

C. B. Booth of Los Angeles, Cal., who recently bought an interest in some mines owned by W. J. Parks and others in the Stanley Butte mining district, near Clifton, states that within the next few weeks he will begin development work there on a large scale.

MARICOPA COUNTY.

The Lorna Doone group of copper claims, near Wickenburg, bonded from Mohnike Bros. by E. G. DeWitt and J. T. May of Colorado Springs, Colo., has had development work started. Sinking will be continued on the 60-foot shaft and at 100-feet drifts, and crosscuts will be made. E. G. DeWitt is Supt.

MOHAVE COUNTY.

The discovery of a big gold deposit by M. F. Wilkinson is reported in the Boundary Cone or Gold Roads district, 30 miles southwest of Kingman. The discoverer and his partner will put a force to work sinking a shaft at once. The ledge is said to be the Treadwell vein, recently sold to Los Angeles, Cal., people.

O. D. M. Gaddis of the Mocking Bird mine, situated in Weaver district, says a new shoot of ore has been uncovered while doing the assessment work. The vein has been considered a blanket ledge, but the ledge has in the last workings straightened up and is now dipping at 45°. The ore body is over 3 feet wide and shows free gold throughout. He states that $20,000 has been taken out from workings on the blanket ledge, and since the ledge has straightened up the values have increased. The property is owned by the Gaddis & Perry Co. and consists of eight claims, equipped with a mill and cyanide plant.

In sinking a winze from the 400 level in the Lucky Boy mine, near Kingman, an 18-inch ore body, said to be almost solid ruby silver, has been opened up. The ore is said to assay several thousand ounces silver and over five ounces gold to the ton. A hoist is to be placed on the mine at once and the winze opened through to the surface and sunk 200 feet deeper. T. B. Scott is the owner.

PIMA COUNTY.

H. Melluish of Tucson is sinking 100 feet on his nickel mine near Tucson. This mine has produced some high-grade ore.

SANTA CRUZ COUNTY.

The new sampling works of the Arizona G. & C. Co. at Patagonia, with a daily capacity of fifty tons of ore, are completed and ready for operation. Manager G. W. Crowe states that the company will begin buying ore.

YAVAPAI COUNTY.

In the Centennial M. Co. No. 2, at Big Bug, a 3-foot ledge of gold ore that assays $32 per ton is reported to have been struck. On the adjoining claims belonging to the same company ores that assay $5 and $6 per ton have also been opened up.

Ewing & Helmrod, who have bought the Ruby group of gold claims, on the Big Sandy, from W. H. Chapman, are preparing to start work on the mines. Ewing & Heimrod contemplate the erection of a complete milling plant, with concentrators and cyanide works.

An electric power plant is projected on Fossil creek, in the northeastern portion of this county, about 50 miles from Prescott. Surveys show water at Fossil creek from which 4000 H. P. can be developed. Mrs. I. E. Tutt of Los Angeles, Cal., is the promoter of the enterprise.

The Union mine, in the Bradshaw mountains, is being worked at present with a force of about fifteen men by a Detroit, Mich., company. The property is opened through a tunnel on the vein, and the company has started to sink a shaft to a considerable depth. W. J. Rainey is the president of the company and H. P. Nagle of Detroit, Mich., is secretary and treasurer. C. J. Kimball is Supt. and D. Kile mine foreman.

M. R. Kiley of the Oro M. Co., operating near Kirkland, states that he expects to have the company's new 150-ton quartz mill in operation by Feb. 15. He has sixty men at work. The mine workings are down 350 feet on a body of gold-bearing ore 6 feet wide.

W. S. Comer and A. Dake have received the first payment on the Gold Queen Nos. 1 and 2 and Kittie mines, located on Lynx creek. Detroit, Mich., people are the buyers. The old Kittie mine was worked in the early days with an arrastra by Mr. Knapp and is said to have been noted for its production of nuggets and coarse gold.

CALIFORNIA.

AMADOR COUNTY.

The annual stockholders meeting of the Lincoln G. M. Dev. Co. of Sutter Creek elected E. C. Voorheis president, C. R. Downs vice-president and T. J. Clavering secretary. The shaft at the Lincoln mine is now 1760 feet deep on the incline, and it is the intention to continue to 2000 feet. In June, 1901, an oil-burning apparatus was installed at the mine in place of wood for fuel. A 1200-barrel redwood tank was erected 160 feet north of the hoisting works, and it is connected with the boilers by a 4-inch pipe.

The Amador-Phœnix ledge has been cut at the 100-foot station. It varies in width from 6 inches to 2 feet 6 inches and is gold-bearing.

The Bay State mine has started work again after a year's idleness. Mr. Brendt is Supt. The mine has been kept free from water during the shut down. It is the intention to crosscut from 800 to 1000 feet to the east.

BUTTE COUNTY.

O'Connor & Grant of San Francisco have bought the Atkins tract, comprising a large block of Oroville river frontage, and lands of the J. Morgan estate, about 100 acres in all, including the bed of Feather river. The same people hold bonds for the Ward & St. Sure tract and the N. B. Crane tract, comprising some 200 acres, also at Oroville. It is probable that work will soon be begun on a dredger for the river front lands. Surveys and preliminary work are now in progress.

The Lava Beds Dredging Co. has been incorporated, capital $500,000, to work dredging ground near Oroville. J. K. Moffit, L. L. Holton, J. W. Goodwin, L. L. Wagner and A. G. Wright are the directors.

CALAVERAS COUNTY.

At the Tilford ranch, near Milton in Salt Spring valley, a fire last summer destroyed the underbrush and chaparral that covered the hills, and exposed many quartz veins that had been hidden by the dense thickets. The owner of the land has been prospecting some of these veins, and getting rock that assays from $2 to $30 to the ton. There are five veins that vary from 4 feet to 100 feet in width. They are in amphibolite schist slates, and can be traced for 2000 yards by croppings and float.

F. O. Courtmarsh of Glencoe has sold the Blue Jay mine, near Jesus Maria, to the Fannie Marie M. Co. of Glencoe for $20,000. He is to be general manager of the property and has bought machinery with which to commence operations.

EL DORADO COUNTY.

A milling test of twenty-five tons of ore from the Bacchi - Collins mine, near Georgetown, made at the Esperanza mill, it is claimed, returned values of nearly $50 per ton. At the Parson mine the shaft is now down about 160 feet, and several drifts from it have been run. T. Schlein is working a pocket mine by open cuts, a 65-foot shaft and over 100 feet of drifts. Over $400 has been taken from a single pocket in this mine. H. S. Martin and A. Presby have bonded the Comstock quartz claim from T. B. Epps for one year and have started work on it.

Development work is being done at the Golconda mine, near Centerville. Six men are running a 320-foot tunnel to tap the ledge. The Golden Gate was recently bought by the Golden Gate M. Co., of Bridgeport, Conn. A. F. Anable is foreman.

KERN COUNTY.

(Special Correspondence).—The Golden mine, owned by J. B. Ferris of Caliente, is 8 miles east of that place. The ores are hauled to Caliente and reduced in a 2-stamp mill and cyanide plant. A tunnel 1100 feet long is to be run to open up the mine 600 feet down. The vein is claimed to be from 40 to 60 feet wide and ore from the richer streaks in it has milled $31 a ton. The Cowboy mine, near the Golden, is a gold and silver proposition, producing some shipping grade ores. Bakersfield people are preparing to develop this property on a considerable scale. J. B. F.

Caliente, Jan 12.

At the Butte mine, Randsburg, the two drifts have come together. They met on a dead level, showing that the engineering was good. The entire distance between the two shafts is 850 feet and the two came together in $100 ore. A winze being sunk and at the depth of 25 feet shows a body of ore from 2 to 5 feet thick, which assays $50 per ton.

It is reported that the Southern Pacific Railroad Co. has bought from the Thirty-Three and Imperial oil companies section 33, in the Kern River fields, for $4,000,000. On the section there are about thirty producing wells, with a gross daily output of 4000 barrels. The purchase includes all improvements in the form of pipe lines, pumping plants and tankage, estimated at $250,000. The value of the land has been roughly estimated at $4,000,000. The selling companies had a good bargain, however, with the Southern Pacific, which it is stated probably led to the railroad company making the purchase. At an early date the Southern Pacific had agreed to handle all the oil produced on the property, for which it was to pay $1 a barrel. The report is unconfirmed, but it may be the company prefers to buy the land at a high figure rather than buy the petroleum at $1 a barrel.

MARIPOSA COUNTY.

At the Garibaldi mine at Kinsley the black ore taken out is very rich and from forty to sixty ounces of amalgam are taken off the plates every shift, with the battery holding 80% of the value in the rock. About thirty tons of ore is crushed every twenty-four hours in the 5-stamp mill, the ore not being sorted.

Sodderberg & Chambers have erected a 4-stamp battery on their mine near Kinsley. This mill is run by water power from the North Fork. They are crushing $40 ore, the vein being 2 feet wide. The Marble Springs mill is still running and giving good returns from the foot wall vein.

NEVADA COUNTY.

The Yuba mine at Maybert is to be started up soon with H. W. Morris as Supt. It is said to be the intention of the owners to put on new machinery.

At the Bonnie Bee mine, near Emigrant Gap, the tunnel on the 12-foot ledge is being driven ahead with machine drills at the rate of about 4 feet per day. The ore at present coming from the mine is high grade. The Bonnie Bee Co. will erect a 10-stamp mill early next spring.

The mill at the Red Cross mine, at Omega, has been destroyed by fire. The building was a total loss, and one of two Huntington mills and the engine and boiler were destroyed. The loss is estimated to be about $18,000, with $6000 insurance.

The Sierra Queen M. Co. has been incorporated at Nevada City by D. L. Miller, W. H. Martin, E. J. Rector, E. T. R. Powell and S. W. Marsh, to operate the Stiles mine.

It is reported that the Mineral Slide quartz mine at French Corral will soon be started up. It is owned by A. R. Dahlberg of French Corral. It is stated that the owners will erect a new mill.

The Siberia Quartz M. Co. has been in-

corporated to mine at Columbia Hill; capital $25,000. The directors are T. Curnow, G. F. Hendricks, R. McMurray, G. A. Bigelow, all of Columbia Hill, and F. Searls of Nevada City.

At the Union Blue Gravel (De Noon) mine at North Bloomfield the long bedrock tunnel is being pushed ahead with all possible haste and it is hoped that inside of fifteen months the gravel channel will be encountered. Supt. Gassaway has three shifts at work and the tunnel is being worked from three points. From the mouth about 600 feet has been run, while from the shaft on the tunnel line and level, some 2000 feet farther along, about 400 feet has been run north, while work has been commenced to connect with the work started at the mouth of the tunnel. At present a soft streak of hedrock is being run through and this ground has to be timbered.

H. Schroeder, W. Torpie and O. B. Marwick have leased the Black Bear mine at Rough and Ready to a San Francisco company, which proposes to develop the ground. It is a low-grade ore proposition, with a large ledge which goes $5 to the ton on an average as far as tested. The mine is opened hy a shaft 75 feet deep and a tunnel now in about 250 feet. It is estimated that the tunnel will give 200 feet of "backs." On the mine is a water power stamp mill with two 1000-pound stamps, and a concentrator.

G. W. Starr, W. B. Bourn, C. E. Clinch and associates have bought a controlling stock interest in the Wisconsin and Illinois mines, near Grass Valley. The amount paid is believed to have been $15,000. The new owners propose to pump out the shaft and make a thorough examination of the property, preliminary to planning the exploitation of the mine. The Wisconsin was located in 1854. The last to work it extensively were Charles Leach, Jacob Neff and the Coleman Bros. The Illinois ledge has been but little worked. The new directors of the company are C. E. Clinch president, L. P. Larue secretary, G. W. Starr, J. M. Lakenan, C. B. Lakenan.

The Mistletoe M. Co. of Nevada City has elected W. E. Parsons, E. B. Power, T. Ingram, W. J. Rogers and D. E. Morgan directors. D. E. Morgan is president and W. J. Rogers secretary. The company will at once proceed to develop the Slide mine, situated near French Corral. The property is composed of the Slide quartz mine, 3000 feet; the Sunset quartz mine, 1500 feet, and about 440 acres of land through which many gold-bearing quartz ledges run. The ledges can all be worked by means of tunnels. In early days considerable work was done upon the Slide mine and a 10-stamp mill (water power) was erected and worked with profit, ore as high as $30 per ton being found. This mill is to be repaired.

PLUMAS COUNTY.

J. D. Whitney has bonded the New York mine, near Greenville, and is doing some development on a large vein of good looking quartz.

The quartz mill at Crescent is crushing quartz from the mine owned by T. F. Emmons of Greenville, which is being operated under lease by J. D. Whitney.

SAN DIEGO COUNTY.

C. W. Pauly, receiver of the Golden Cross mine at Hedges, now the Free Gold mines, has submitted to the court his eighth report of operations. His statement shows: Bullion produced from mill, run from October 4 to November 4, $9754.45; cyanide plant returns, November 11, $6359.84; November 21, $5346.16; total hullion and cyanide, $21,457.45; total receipts, $22,892.55. The expense for labor was $7895.60; freight, $895.14; merchandise and supplies, $11,133.31.

SHASTA COUNTY.

The Iron Mountain mine, near Keswick, has started up. The fire which recently caused a suspension of operations is said to be under absolute control. One hundred men have been placed in the lower tunnel, known as the Confidence tunnel. It is said that 400 men will soon be working in the other drifts.

SISKIYOU COUNTY.

Whip & Poole of Colorado have bonded the Empire Bar mine, on Klamath river, for $6500. The claim is owned by D. McCarthy, J. Garvey, R. S. Taylor and J. F. Lodge of Yreka.

A good cleanup has heen made at the Ball mine, near Sawyer's Bar, from about 1500 tons of ore worked during December that averaged over $10 a ton. The sulphurets saved, it is claimed, more than pay the running expenses of the mine.

F. LeMay of Yreka says he has found an extensive ledge of jade, a green gem stone, valuahle for jewelry and used considerahly hy the Chinese in the manufacture of ornamental rings and bracelets, taking a brilliant polish.

It is stated that work will be started again in the Blue Gravel mines at Yreka.

TRINITY COUNTY.

The water from East and West Weaver creeks has heen turned into the pipe of the Sweepstake mine, near Weaverville, and the water on the mine is available for work. The ditch, pipe line and siphons are practically completed. At the pipe camp the machinery has heen taken down and stored.

TUOLUMNE COUNTY.

The Wheal Perrin mine, near Soulsbyville, has heen bonded to H. J. Sisty at $15,000 and 15% of the gross output until the mine is paid for. The property is owned by Mrs. Richards of Soulsbyville and V. Wooters and W. Glasson of Sonora.

D. Lumsden, J. Screech and G. L. Adams have bonded at $10,000 the Blue Eagle quartz claim to W. Berry. The mine is located in the Jawbone district on the Tuolumne river.

Work has been resumed at the mines of the Green Jumper Co., near Confidence. A crosscut tunnel is being driven in to tap the Jumper vein. It is understood that a mill will probably be erected in the near future.

The Stockton Smelting Co., D. N. Stradley manager, proposes to increase the capacity of the works at Sonora by the installation of additional crushers and other machinery.

Very fine ore is coming from the Snowflake mine, near Soulsbyville. The shaft is 70 feet deep. The vein is 2 feet wide and assays show values ranging from $67 to $140 per ton.

H. S. Scott is driving a tunnel into the Rough and Ready gravel mine on Tahle mountain, near Chinese Camp. The face of the tunnel shows pay gravel. The tunnel is now in 950 feet.

Underground work has been commenced at the Hope mine, owned by S. Ralston, near Sonora, and the 10-stamp mill started up. The mine is on the pocket belt, but the ore is said to be of good milling character.

COLORADO.

ARAPAHOE COUNTY.

It is reported that mine owners of Utah, Idaho and Colorado are holding a meeting in Denver, beginning Jan. 15th, to form an organization whose principal purpose will be to construct either one immense smelter at a central point for all their properties or one smelter in each State, to he independent of the trust. In Utah the men identified with the new movement include D. Keith, Senator Kearns and E. F. Holmes of the Silver King mine at Park City, J. Farrell of the Quincy and J. E. Bamberger of the Daly-West, also at Park City, and W. S. McCornick of Salt Lake City. The conference, according to a later statement, has been postponed to a date not yet fixed on account of the inability of many of the prominent men interested in the proposed organization to be present. It is understood that a much more comprehensive organization than the one originally planned is being prepared, and that the action of the coming conference will be of far-reaching importance to the lead and silver interests of the country.

BOULDER COUNTY.

The Caryl properties at Wall Street have been sold to Mrs. K. L. Cook of Wall Street, who proposes to work them on a larger scale than heretofore.

At tbe Dolly Varden mine at Ward a streak of ore has been opened up which has developed into a large hody about 24 inches wide, half solid smeltlng ore. It runs from $100 to $125 a ton. M. A. Sears is general manager and J. M. Doud Supt.

CHAFFEE COUNTY.

The work of clearing away the debris of the burned Buena Vista smelter has heen commenced and the construction of a new one started. Tbe furnace will be increased to double the old capacity, and a second furnace installed. It is hoped to have the plant ready for operation early in the spring. The Buena Vista S. & M. Co., which owns the smelter, has been merged into the Gold M. & M. Co., which owns the Mary Murphy mine at Romley

CLEAR CREEK COUNTY.

The Perigo property, near Central City, is to he operated by the owners, Potter & Lighthourne, after having been successfully worked for several years by the Tonawanda L. & M. Co. It is understood that Mr. Lightbourne will be Supt., wlth D. C. Earl as underground foreman.

G. E. McClelland of Idaho Springs, managing director of the Monarch M. Co., and who is driving the McClelland tunnel from Dumont to the Lamartine mine, states that he commenced the tunnel on the first of last July and on the 10th of January had completed 1000 feet. He is working three shifts every day in the month.

The Argentine tunnel of the Waldorf Co. will pass under the crest of the Continental Divide, 1500 feet helow the surface. The tunnel, 8x8 feet in the clear, is belng driven hy hand at present, two shifts being employed, and is now 500 feet in length. Its entire length when completed will be 9000 feet and it will connect with the fourteenth level on the Stevens group on the western side of the range, which is now 2000 feet in length. To complete the tunnel 6500 feet more will have to be driven. The company is planning the installing of power drills at both ends of the tunnel in the early spring.

EL PASO COUNTY.

The Waldo S. & M. Co. has been incorporated with C. L. Tutt, S. Penrose, C. M. McNeill, K. R. Babbitt, H. C. Hall, J. O. B. Gunn, T. W. M. Draper and R. C. Thayer as directors. The capital is $3,000,000 and principal office is Colorado Springs. The company will operate copper mines near Waldo, Josephine county, Oregon.

GILPIN COUNTY.

P. Mixsell of Denver, who is interested in the Mixsell-Burroughs mine in Gilpin county, says shlpments of ore now being made by him are running $65 net per ton, principally in gold.

HUERFANO COUNTY.

The Sierra Blanca M. & Red. Co., at Blanco, have a tunnel in 1400 feet and are hauling ore to the railroad. A mill and tramway will be erected and in running order before next July. The capacity is to he fifty tons per day, but the expectation is to enlarge the machlnery at a later date.

LAKE COUNTY.

The report of Secretary T. S. Brigham shows that during 1901 the South Winnie Co. of Leadville shipped 114 tons of ore, from which the net returns were $966.80. The operators of the South Winnie lease shipped 1876 tons of a net value of $46,795.81, of which the company received $12,487.86 in royalties.

OURAY COUNTY.

The Camp Bird Extension M. Co. has made final payment and received deeds for thirty mining claims about Imogene basin, near Ouray. The company has recently installed an electric drill in their main tunnel. The tunnel heading is advanced at the rate of 4½ feet each shift. It has been in ore for over 300 feet without a break, the ore streak averaging 4 feet. It is the intention of the company to build a mill early this season.

SAGUACHE COUNTY.

A rich strike in the Independent mine, at Crestone, is reported. The vein is 7 feet wide and was uncovered at a depth of 250 feet. The ore is gray quartz with white iron, and assays give $50 gold to the ton.

SAN MIGUEL COUNTY.

The Japan Mine Co. has resumed work on its mines in Marshall basin. Two air drills are working in the long crosscut tunnel that will open the Japan vein 600 feet below the present workings. A new mill of 150 tons daily capacity has been ordered. Thirty-five men are employed driving the tunnel.

TELLER COUNTY.

It is reported that the Elkton Con. Co., at Cripple Creek, has bought the Standard tunnel for $50,000. It is bought by the Elkton to provide a drain for the water from the mine. It is said that the tunnel will he extended some 2300 feet and cut the Elkton shaft at ahout 725 feet, enablIng the saving of the pumping expenses of a great quantity of water.

The water in the Elkton shaft is compelling the company to install another large pump, probably at the 700-foot level. The addition is expected to nearly double the volume of water discharged and, it is anticipated, will free the 800-foot level, which has been submerged for nearly a year. The boiler capacity will be increased from 1000 H. P. by two boilers of 250 H. P. each, bringing the total power up to 1500.

The Pointer M. Co. has granted a two-year's lease on the property on Gold hill, at Cripple Creek, to R. P. Russell. According to the terms of the lease, 300 feet of sinking is required. The royalty is graded. On all ores shipped up to $15 a ton, 15%; up to $100, 25%; and over $1000, 35%.

IDAHO.

BLAINE COUNTY.

The Mayflower M. & M. Co., Ltd., has been incorporated, capital $600,000, with office at Boise. The directors are A. Wilson of Martin, W. D. Garlock, J. H. Laing and J. R. Good of Boise and B. Mason of Nampa. The company owns the May Bell, Park Mammoth and Park Mammoth Fraction lodes, in Lava Creek district, near Hailey.

LATAH COUNTY.

F. Jenkins of Moscow is arranging to work the property of the Horse Shoe Placer M. Co. on Salmon river, which has heen owned in Wardner for several years. It is proposed to put on a dredger costing about $60,000.

SHOSHONE COUNTY.

The Oro Grande M. Co., with headquarters at Orofino, has been incorporated, capital $1,000,000, to work deep placer ground north of Pierce City, on the Oro Grande, a tributary of the north fork of the Clearwater. The incorporators are H. L. Gray, C. C. Smith, F. P. Mesick, O. A. Anderson and A. E. Holmberg, all of Orofino.

The Grangeville Hydraulic M. Co., with office at Grangeville, has heen incorporated, capital $150,000, with B. C. Wiltse, W. R. Crosby, B. L. Crosby, J. C. Meingassner and C. G. Aldridge directors. The company operates in the Pierce City district.

The shipments of ore from the Cœur d'Alene mines for the year 1901 were 148,890 tons, as compared with 171,412 for the precedlng year, a reduction of 13%.

MONTANA.

DEER LODGE COUNTY.

On the copper claim owned by M. F. Jensen and J. Simonsen, near Anaconda, a lead over 100 feet wide has been struck showing pay ore.

FLATHEAD COUNTY.

From the Sullivan mlnes, owned by Sullivan Bros., on the Stillwater river, near Kalispel, a recent trial shipment of 1600 pounds netted a clear profit of $9. The packing from the mines to the nearest railroad point alone cost $2.50 per hundred pounds. The mine is a copper proposition.

GRANITE COUNTY.

F. D. Brown, manager Sunrise M. Co. in Flint River valley, between Philipsburg and Drummond, says his company is putting in a large cyanide plant to treat ore from its mines with much less cost than at present.

JEFFERSON COUNTY.

H. F. Poland, manager Boss Tweed gold mines at Pony, owned by A. C. Burrage and associates of Boston, Mass., says that in the equlpment of the Boss Tweed a tramway from the mine is being constructed, and at its terminus a big mill is being erected at the mouth of the main tunnel on the mine.

A. S. Ray, who has been in charge of sinking a shaft on the Boulder mine, near Basin, owned by the Boulder-Comstock M. Co., has made arrangements for the lnstallation of a hoist. He has sunk 200 feet with a whim. The Boulder vein is from 6 to 8 feet wide between walls and carries copper and gold.

LEWIS AND CLARKE COUNTY.

The Vautour mine on Red mountain, near Helena, is to be developed to depth. D. J. Tallant and J. Peterson, who have leased lt from Beattie Bros., have installed a steam hoist and propose to slnk to the 300-foot level.

SILVER BOW COUNTY.

It is reported that the Ophir claim at Butte will soon be ln operation again, the Ophir M. & D. Co. havlng been incorporated hy W. G. Young, F. Harris and A. B. Clark of Butte, J. T. Morrison of Racine, Wis., and M. Newberger of Chicago for that purpose. The capital is $200,000 and the principal office of the corporation is in Butte. The Ophir mine is one of the oldest in the district and has yielded considerable gold and silver. With the exception of a few months, however, it has not heen worked since the drop in silver in 1893.

Work was resumed on the 15th inst. in the Mountain View mine, of the Boston & Montana Co., which has been shut down since last October. It is stated that the other mines of the company are to be started at once. When they were shut down they were producing 2000 tons of ore a day. The smelter at Great Falls has also been started up again, and it is stated that orders have heen received by the Great Northern Railway to haul 1500 tons of ore daily from Butte to Great Falls.

NEVADA.

HUMBOLDT COUNTY.

The Sheba M. Co.'s officers, H. M. Wells, Judge Bartch, C. O. Whittemore, J. P. Boyle, M. H. Hennessy and C. H. Vale, have been at the mine at Humboldt to select a site upon which it is proposed to erect a concentration mill.

LINCOLN COUNTY.

S. A. Bedell and J. H. West of Needles, Cal., have sold the Leland group of eight claims, near Needles, for $50,000, to people represented by T. Ewing of Los Angeles, Cal. The new owners will continue work already hegun by them while operating under a hond.

At the De Lamar mine at De Lamar dry crushing bas been finally abandoned and replaced by wet crushing. The new plant is equipped wlth Chilean mills.

NYE COUNTY.

Reavis & Nelson have bonded the Little

Butte and Yellow Aster claims, near Tonopah, to J. Young at $30,000. Mr. Young agrees to sink 100 feet and should the ledge, which assays $20 in gold a ton, go down, the property will be taken over.

LYON COUNTY.

A new 100-ton cyanide plant is being built at the old Carson Valley mill site, 6 miles below Yerington, to work the large deposit of Douglass mill tailings. It is estimated that there are about 400,000 tons of these tailings and they are under bond to A. F. Rogers.

OREGON.

BAKER COUNTY.

The Gilkison group of copper claims in the Copper Butte district has been bonded at $50,000 for sixty days. This is a property first exploited in 1873, when a furnace was erected and several tons of copper smelted. Recently a new ledge was discovered which, it is said, shows an ore body 12 feet wide, with an assay value of 12% to 30% copper.

GRANT COUNTY.

A representative of the stockholders of the Badger M. Co., owners of the Badger and other quartz claims at Susanville, has been at the mines several weeks, making examinations looking toward the erection of a reduction plant in the spring.

JOSEPHINE COUNTY.

Smith Bros. have sold a half interest in the Baby mine, in the Jump-off-Joe district, near Grant's Pass, to F. F. Hannum and W. S. Town. The other owners of the mine are A. L. Meyers and H. G. Rice. A clean-up of thirty ounces has been made from eight days' run with a 2-stamp mill.

W. H. Dana, manager of the Copper Stain mine, on Mt. Reubon, near Grant's Pass, states development work is being continued, and it is the intention to put on a 10-stamp mill next spring. A wagon road to the mine will be one of the first improvements made.

The copper property on Little Pickett creek, near Grant's Pass, owned by H. E. Booth and R. E. Barrickman of Merlin, is being opened by a tunnel. The ledge is about 12 feet wide and carries values in gold as well as copper.

MALHEUR COUNTY.

The Malheur M. Co. of La Grande has elected M. E. Simpson president and R. M. Cann secretary. The company's mine near Malheur City is being developed, one shift of men working in tunnel and one in shaft. A mill will be installed in the spring.

NEW MEXICO.

COLFAX COUNTY.

A vein of free gold ore has been struck on the Legal Tender mine at Elizabethtown. The ore, it is claimed, runs $20 a ton from a 3½-foot vein.——On the Senate Bob-Tail mine a strike has been made of ore which runs high in gold and silver and is sufficiently large to be worked at a profit.——The 200-foot tunnel on the McGinty mine has struck the vein exposing a fine body of ore.

DONA ANA COUNTY.

The Central G. & C. Co. at Gold Camp in the Organ mountains has struck a body of ore in the Bullion mine 2½ feet thick that, it is reported, runs $125 to the ton and carries good values in copper and silver.

Attention is being attracted to the Picacho mountains, 6 miles west of Las Cruces, a low range cut and broken by deep ravines. The principal mineral is iron, of which huge ledges extend for miles south and north, carrying from 40% to 60% iron. H. Bauer of Las Cruces has struck gold ore that assays $8 a ton.

GRANT COUNTY.

The Empire C. Co. has been incorporated at Phœnix, Ariz., capital $100,000, by D. C. King, J. Askroft, G. P. Gates, J. A. Herrera of Phœnix, Ariz., and J. G. Hilzinger of El Paso, Texas, to operate at Santa Rita.

OTERO COUNTY.

B. F. Schermerhorn, Supt. of the Three Bears mine at Jarilla, has run a tunnel 30 feet upon a shoot of very high grade ore, and has sunk a shaft 140 feet and run 400 feet of drifts.

SANTA FE COUNTY.

The San Miguel mine, near Golden, is to have an arrastra installed to treat the ore. The San Lazarus Co. has a large force employed with Mr. Conger as Supt. The company expects soon to have ore to keep its mill running steadily.

SOCORRO COUNTY.

E. Craig, owner of the Last Chance mine, near Mogollon, has installed the cyanide process and states it has proved successful. The process recovers, he claims, 90% of the values in the Last Chance ore and costs but $2 per ton.

TAOS COUNTY.

The drill on the Anaconda mine, near Red River, is down about 410 feet and is to be put down to 500 feet. At that depth if the vein, which at the surface dips at an angle of 45°, is not cut, a second drill hole will be put down close to the old shaft. If the vein is encountered it is said reduction works will be erected.

W. Vandever & Co. will resume work on the Mark Twain mine near Lobo.

I. T. Burns and Elizabeth Burns of Taos have sold to E. Hatton the Gold King and Gold Queen mining claims at Red River.

TEXAS.

Chamberlain & Malley on the 10th inst. broke the world's record in the miners' drilling contest at El Paso. Four double-handed teams entered the contest. The record made by Chamberlain & Malley of Arizona was 40⅛ inches in fifteen minutes, which beats their own record by a quarter of an inch.

Oil has been struck near Columbia in an entirely new field, situated about 150 miles west of the Beaumont oil district. The well is reported to be a genuine gusher and flowing at least 30,000 barrels of oil per day. The oil has not yet been tested, but it has the appearance of being of the same character as the Beaumont oil.

UTAH.

SALT LAKE COUNTY.

The properties of the Old Evergreen M. Co., between Park City and Alta, are to be systematically developed. In the original working copper ores carrying gold and silver were mined, but no depth was ever attained. H. G. McMillan of Salt Lake City is secretary of the company.

The main tunnel which is to be the main outlet for the Dalton & Lark, Brookline, Antelope and other of the Bingham Con.'s group of Bingham mines, draining the entire territory embraced within them, is now in 2200 feet and is advancing toward the 8500-foot station, the intended end, at a rate of progress that V. B. Sherrod, the company's engineer, says almost insures its completion in a year. A record of 87 feet in a single week has been made. The first connection will be at 4336 feet, where the Miner's Dream vein will be tapped, while the shaft which is now going down will reach the tunnel level at the 4500-foot station, and enable drifting both ways from headings from it.

SUMMIT COUNTY.

The zinc plant at Park City has begun 1902, Manager Mayne states, with an output of twenty tons daily of concentrates that yield from 55% to 60% zinc per ton, and with a by-product which carries as much as 45% iron, twenty ounces silver and 7% lead per ton, each of these products paying a margin of profit.

TOOELE COUNTY.

The Silver Copper King M. Co. has been incorporated, capital $30,000, with W. S. Naylor president and J. J. Whitaker secretary. The company owns the Silver King, Silver King Nos. 1, 2 and 3, Grace, Excelsior, Thad, Mother, Mother South and Monster claims, in the Erickson district.

WASHINGTON.

JEFFERSON COUNTY.

A rich strike of gold-bearing quartz is reported on Donwallips river, 20 miles from Port Townsend. Croppings, it is claimed, assay $150 to $200.

FOREIGN.

BRITISH COLUMBIA.

J. H. McKenzie, manager of the L. Roi mine at Rossland, states that the decline in copper has made a difference to that mine of about $1.14 a ton in the price received for the ore. It is claimed, however, that the recent improvements in the Le Roi plant have brought about a reduction of 50 cents a ton in the cost of mining, while betterments in the process of calcining at the Northport smelter have reduced the cost of smelting 75 cents per ton, making a total reduction in cost charges of $1.25 a ton, while the loss through the drop in copper has been only $1.14 a ton.

The Lardeau district in 1901 produced 37273 tons, valued at $375,016. The Boundary district in 1901 produced 371,873 tons against 99,730 tons during 1900—a gain of 272,143 tons. The Rossland district in 1901 produced 293,200 tons against 221,902 for 1900—a gain of 71,298 tons. The total export in 1901 of the Slocan district, including both the dry and the wet ore belts, is estimated at 35,000 tons.

Development work on the Lardeau Valley Mines, Limited, at Lardeau, is progressing favorably, according to J. Rutherford, engineer in charge. The ore assays about $58 per ton, carrying gold, silver, copper and lead values.

The Silver King mine at Nelson, during the three months ending Sept. 30th, made a net profit of over $60,000 on its own ore and a further profit of $20,000 was made on smelting custom ore. During the following four weeks the output of the mine was 3086 tons, averaging 27.78 ounces of silver and 6½% copper. The ore reserves are estimated at 20,000 tons.

During 1901 the total production of ore from Ymir district was nearly 90,000 tons. The larger portion was by the Ymir mine, which has averaged about 5500 tons per month. The other producers are the Yellowstone, the Arlington, the Fern, the Wilcox, the Tamarac and the Second Relief. At the Ymir mine between 60,000 and 70,000 tons of ore were treated by the 80-stamp mill, the profits from which have been sufficient to return $192,000 dividends, amounting to 20% of the capital.

The gross value of the ore shipped from Rossland mines during 1901 is estimated at $3,700,000. The camp's output, as secured from the mines, is as follows:

Mine.	Tons.
Le Roi	150,876
Centre Star	53,600
Le Roi No. 2	39,160
War Eagle	19,900
Rossland G. W	10,681
Iron Mask	3,733
Homestake	20
I. X. L	230
Spitzee	200
Velvet	563
Monte Cristo	20
Evening Star	74
Giant	74
Portland	24
Total	279,133

The properties of the Morrison Mines, Ltd., in Deadwood camp, Greenwood, have been bonded to New York and Chicago people at $185,000. President J. Hunner and Manager F. H. Oliver state that the bond is taken in the name of A. C. Whitney, trustee, of Chicago, with a cash payment of $5000 being made, the second payment of $80,000 is to be made within sixty days, and the final payment of $100,000 on July 1 next.

KLONDIKE.

The Dago Hill quartz find is reported now sufficiently developed to warrant the assertion that it is a commercial proposition. The ore goes $78.44 to the ton, and the ledge at present is 30 feet in width. The company operating it has taken out some ore and a great deal of work is mapped out for the property. The owners of the stamp mill have announced that for the present they will handle all ore from the new prospects now being opened up free of charge as a means of encouraging quartz prospecting. The mill is a small one, having but five stamps, but it will be increased in size and capacity as conditions and the demand warrant.

Personal.

W. S. KEYES has returned to San Francisco from Calaveras county, Cal.

E. H. BICKFORD is manager Lake Valley Mine Co., Lake Valley, N. M.

J. J. CRAWFORD has returned from El Dorado county, Cal., to San Francisco.

W. J. SHARWOOD of Marysville, Mont., is visiting Soulsbyville, Tuolumne county, Cal.

W. WESTON of Denver, Colo., was at Kingman, Ariz., during the first part of this week.

J. B. BACHICH has been appointed Supt. of the Golden West mine, near Sonora, Cal.

J. O. ROUNTREE has returned to Portland, Or., from a short sojourn at Ketchikan, Alaska.

PERCY WILLIAMS has resigned the superintendency of the Century M. Co., at Park Valley, Utah.

F. O. CORTMARSH has returned from Boston, Mass., and is now Supt. Blue Jay mine, near Jesus Maria, Cal.

F. B. HENDERSON has been appointed manager Associated Oil Companies, with headquarters in Bakersfield, Cal.

J. H. JENKINS, late manager Tonopah M. Co., Nevada, was in Salt Lake City, Utah, on the 11th inst., en route East.

G. A. WAGNER is manager Cerbat M. & Red. Co., operating the Alexander mine, at Union Basin, Mohave county, Ariz.

B. L. SMITH of Eureka, Nev., has been appointed Supt. of the Richmond M. Co. of that place, succeeding R. K. Morrison, deceased.

FRED ZEITLER has resigned as Supt. Champion mine, Nevada City, Cal., and has made arrangements to locate in San Francisco.

W. CLIMO, Supt. Shannon mine, at Clifton, Ariz., has returned to that place from several months' sojourn in England and Europe.

CHARLES L. LANG has resigned as Supt. Mack Con. M. Co., at Big Oak Flat, Cal., which position he has filled for the past three years.

J. W. MORGAN has been appointed Supt. St. George mine, at Stookton Hill, Mohave county, Ariz., succeeding T. McMahon, resigned.

MANAGER V. BARND of the Tybo M. & R. Co. of Ely, Nev., and A. Oldoerp, E. M., of Parral, Mexico, were in Tonopah, Nov., last week.

A. GRAVES, manager of the Alma M. Co. at Carbo, Sonora, Mexico, is in Denver, Colo., testing ores from the mines to determine a process for adoption.

T. A. YAGERMAN of London, who has been at Ouray, Colo., examining the Camp Bird mine for the Venture Co. of London, has returned to London and will go from there to the Transvaal.

SAM T. PARKS of Jackson, Cal., left San Francisco on the 9th inst. for Panama, Colombia, where he goes on the staff of the Darian G. M. Co., of which W. E. Proctor of California is Supt.

A. B. HALL has resigned as Supt. Reward mine, Independence, Cal., and has accepted a similar position with George & Co. of Los Angeles, Cal., taking charge of their mine at Hot Spring Junction, Ariz.

JESSE J. MACDONALD, M. E., has resigned his position with the Gold & Silver Extraction Co. of America, Ltd., but will continue to identify himself with cyanide matters in California and Arizona, being personally established at 128 N. Main St,, Los Angeles, Cal.

Commercial Paragraphs.

A. LESCHEN & SONS' ROPE Co., of St. Louis, Mo., have moved their Chicago offices to 137 Lake St., where they will carry a full stock.

THE Feather River Exploration Co., Oroville, Cal., has contracted for two new dredgers, to be built by the Risdon Iron Works, San Francisco, Cal.

THE Spring Valley Water Co., of San Francisco, Cal., will put in three new engines, each with daily capacity of 4,000,000 gallons. They will cost $70,000.

THROUGH its English agents, Geo. Angus & Co., the New Process Raw Hide Co., Syracuse, N. Y., in one month received orders for its new process noiseless pinions from eleven leading British electric companies.

ADAM SCHILLING & SONS, manufacturers Golden Gate gas engines, 211-213 Main St., San Francisco, Cal., shipped this week a 16 H. P. hoist to the Ricawillibe Mines, Ltd., Slocan City, B. C. The construction of the machinery is such that the hoist can be thrown out of gear and the engine used for other purposes.

THE Con. Cal. & Va. M. Co. has awarded a contract to the Allis-Chalmers Co. of Chicago, through their agent, George E. Ames, No. 137 Montgomery street, San Francisco, for three duplex double acting electric driven Riedler pumps, each having a capacity sufficient to raise 1500 gallons per minute from the 2150-foot level to the Sutro tunnel, an elevation of about 450 feet. Each of these units will be driven by a 225 H. P. Westinghouse induction motor, operating at a speed of 495 revolutions per minute. It is intended that these pumps shall run at 110 revolutions per minute, and the motor speed reduced to that of the pumps by means of cut cast iron gearing. The combined capacity of these three units will be 4500 gallons per minute, and they will be arranged that they may be operated singly or in combination. The electrical energy will be transmitted from the surface to these pumps on the 2150 station at a potential of 2300 volts by means of a three-conductor, iron-armored, lead-covered cable. This is the second step toward the final unwatering of the Comstock, and it is believed that these pumps working in combination with the hydraulic elevator now in use will enable the Con. Va. people to reach the bottom of the C. & C. shaft within the present year. The general arrangement for the pumping plant was perfected by Supt. Joseph R. Ryan and Leon M. Hall, consulting engineer for the mining companies, and the pumps will be of the well-known Riedler type, with mechanically operated valves.

"TWELVE inches, one foot; three feet, one yard." Generations of school children have repeated the formula in monotonous sing-song, little dreaming that a yard might not be the same everywhere. When some of the boys grew up and became surveyors or constructing engineers, they found that feet and yards were variable quantities; that diversity of standards and mechanical inaccuracies in tapes were stumbling blocks in the way of perfect work. The uncertainties of the situation were curiously illustrated in Philadelphia a while ago, when each side of a piece of land had been measured by a different standard. In overcoming the first difficulty, the United States Government has taken the initiative by establishing the National Bureau of Standards, which

is soon to have a fine building of its own on the line of Connecticut avenue, in a suburb of Washington. Private enterprise has come as near as human effort can to disposing of the second difficulty. Over and over again have the steel tapes made by the Lufkin Rule Co., of Saginaw, Mich., been tested by Uncle Sam's experts. Discrepancies between these tapes and the standard have indeed been found, but they were expressed in decimal fractions so small as to be meaningless to the layman and of no practical importance to engineers, accustomed as they are to mathematical hair-splitting. To understand the work of the Lufkin Rule Co. it is scarcely needful to remind readers of this journal that a steel tape is as sensitive as an exposed nerve in a tooth. It is affected hy changes of temperature that even a sick bahy would not feel. A cold finger or a warm breath makes a difference in it. Yet the Lufkin tapes are made of steei so excellent and uniform in temper and are graduated with such nicety that the makers feel warranted in giving a guarantee of accuracy. That this confidence is shared by engineers and by teachers of engineering has been abundantly proved. When you stop to think of it, the dependence of mechanical art upon a thin rihbon of graduated steel appeals strongly to even a dull imagination. The Lufkin tape is more than a mere article of commerce. It is a valuahle contrihution to the branches of industry which do most for the material and intellectual progress of society.

Books Received.

"Mineral Resources of the United States for the Calendar Year 1900," by the U. S. Geological Survey, Charles D. Walcott director and David T. Day, Chief of Division of Mining and Mineral Resources, 8vo, 927 pages, is the gathering together, completion and publication in one volume of the data heretofore published hy the Geological Survey in bulletins. The volume is quite complete in its statistical information and is valuable for reference. It is published hy the Government Printing Office at Washington, D. C.

"Power and Power Transmission," by E. W. Kerr, M. E., assistant professor of mechanical engineering, Agricultural and Mechanical College of Texas, 8vo, 356 pages, 246 figures, is a text-hook for students of mechanics, made up largely from the suhject matter of lectures delivered hy the author to students of the elementary principles of engineering, and is, as the author says, rather a collection of such principles and information as would direct the beginner along the proper course of study than an attempt to add new material to the science. Published by John Wiley & Sons, New York. Price, cloth, $2.

Recently Declared Mining Dividends.

	Payable.
Yankee Con. S. M. Co., Utah, 5 cents per share, $25,000	Feb. 1
May Day M. Co., Utah, 1 cent per sbare	Jan. 20
Portland M. Co., Colorado, quarterly, 6 cents per share, $180,000.	Jan. 15

Latest Market Reports.

SAN FRANCISCO, Jan. 16, 1902.

SILVER.—Per oz., Troy: London, 25 $\frac{15}{16}$d (standard ounce, 925 fine); New York, bar silver, 55½c (1000 fine); San Francisco, 55½c; Mexican dollars, 45½c San Francisco, 44½c New York.

COPPER.—New York: Lake, 1 to 3 casks, $11.50; carload lots, $11.25; Electrolytic, 1 to 3 casks, $11.12½; carload lots, $11.00; Casting, 1 to 3 casks, $11.00; carload lots, $10.75. San Francisco: $14.15. Mill copper plates, $17.15; bars, 24@18c. London: £45 10s per ton.

LEAD.—New York, $4.00; Salt Lake City, $3.50; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £10 7s 6d per ton = 2.16 cents per lb.

SPELTER. — New York, $4.35; St. Louis, $3.95; London, £16 10s per ton; San Francisco, ton lots, 5c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

IRON.—Pittsburg, Bessemer pig, $16.00; gray forge, $15.00; San Francisco, bar, 2.60c per lb., 2.65c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $27.00; open hearth billets, $29.50; San Francisco, har, 7o to 12c per lb.

TIN. — New York, pig, $23.50; San Francisco, ton lots, 26c; 1000 lbs., 26½c; 500 lbs., 26¼c; 200 lbs., 26½c; less, 27c; bar tin, ℔ lb, 30c.

PLATINUM.—San Francisco, crude, $19 ℔ oz.; New York, $20.50 per Troy oz

BISMUTH.—New York, ℔ lb., Subnitrate, $1.50; San Francisco, $2.50 to $2.75 lt lots.

QUICKSILVER. — New York, $51.00 large lots; London, £8 17s 6d; San Francisco, local, $48.00 ℔ flask of 76½ lbs.; Export, $45.00

MAGNESIUM.—New York, $2.90 ℔ lb.; San Francisco, $3.75.

ZINC.—San Francisco, 5½c; slab, 5¾c; bar, 7c; zinc dust, N. Y., 6c.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 17c; San Francisco, Plumbers', 100-lb. lots, 14.25c.

NICKEL.—New York, 50@60c ℔ lb.

PHOSPHORUS.—F. o. b. New York 50@60c ℔ lb.

FERRO-MANGANESE. — Pittsburg, 80%, domestic, $53.50, large lots.

TUNGSTEN.—New York, ℔ lb., 95c; San Francisco, $1.15.

FERRO-TUNGSTEN. — New York, 37%, 32c; San Francisco, 65c (60%).

ASSAY LITHARGE.—San Francisco, 10c ℔ lb, small lots.

POWDER.—F. o. b. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12o. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 30@31c ℔ lb.; carloads, 28@29c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2½@3c ℔ lb.; blue vitriol, 5¾@6¼c ℔ lb.; horax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 6c; alum, $1.90@2.00; flour sulphur, French, 2½@2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bhls., $1.25@1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $7.00; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $8.50; Colorado Anthracite, $14.50. Coke, $16 per ton in hulk; $18 in sacks.

OILS.—Linseed, pure, boiled, bbl., 72c; cs., 77c; raw, hhl., 70c; cs., 75c. Deodorized Stove Gasoline, bulk, 14½c; do., cs., 20½c; 86° Gasoline, bulk, 20c; do., cs., 26c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 13½c; do., in cs., 19½c; Lard Oil, Extra Winter Strained, bbl., 90c; cs., 95c; No. 1 bbl., 65c; cs., 70c. Neatsfoot Oil, coopers' bbls., 60c; cs., 65c; No. 1 bbl., 50@52½c; cs., 55@57½c.

Notices of Recent Patents.

Among the patents recently ohtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

WEIGHING AND RECORDING APPARATUS.—No. 690,855. Jan. 7, 1902. Wm. Green and S. Cbisholm, San Franc'sco, Cal. Tbis apparatus is designed for weighing purposes. It conciets of a weight, a motor, means intermediate by which tbe weight is caused to move along tbe scale heam until it arrives at a point wbere the weigbt is counterbalanced and the heam sinks, and electrical contacts through which the current passes to drive the motor, oce of which contacts is hroken hy the sinking of the heam so that the balance weight stops at a point indicating tbe amount.

AUTOMATIC CAN HEADING MACHINE.—No. 690,593. Jan. 2, 1902. A. W. Livingston, Alameda, Cal. The object of this invention ie to rapidly and accurately apply the heads to cans, and it consists of conveyore hy which the heads and bodies are separately introduced into the machine, the heads placed upon the bodies and means for seaming the heade and bodies, which means include a revolving table having revoluble guides or epiders around the periphery upon whicb the can hodies are held and the can bodies are received and centered upon tbe bodies the whole

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MINING AND SCIENTIFIC PRESS.

Whole No. 2166.—VOLUME LXXXIV. Number 4. SAN FRANCISCO, SATURDAY, JANUARY 25, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Community of Interest in Gold Mining.

The principle of community of interest which is the hasis of the notahle change in the commercial organization of industry in the United States has received little attention so far from gold mine operators. At first casual consideration it might appear as though there was no place for it in their husiness. A closer examination will show a place for its application even in this most independent of all industries.

The community of interest principle is, in its hroadest, most comprehensive sense, the ultimate development of devices for avoiding or saving wastes and insuring increase. That many of its applications have created mischievous and unnecessary monopolies is the incident of the evolution of an idea into a system. The structural weakness shown is the weakness of the human element, which is for a time persistent in its ultimately futile efforts to heat the machine, and is not an inherent weakness in the principle itself.

In gold mining this element of weakness can he cut out. All gold miners are direct creators of wealth, or of money, its universal representative. The community of interest idea is not affected hy the personal equation arising out of the law of supply and demand. All possihle gold mines can be conceived of as heing profitahle to their individual operators independent of the number of the mines, the numher of individual operators and the different degree of profit they gain. Comhination of the ownership of the mines is not at all a condition precedent to community of interest in operation of the mines.

All gold miners are directly interested in the avoiding and saving of wastes, since these mean the direct and certain increase of the profit margin. They have a community of interest here which is real. If, hy the application of the idea an operative plan can he provided which will avoid and save wastes, gold miners should use it.

Without considering the principle ahstractly at all, the practice of gold miners has already provided many concrete examples of its more or less partial application. It would seem as if the time has come in which hy the frank, direct recognition of the principle, and hy its study in the ahstract, substantial advances could he made on the partial practice already estahlished.

Gold miners have lost much in the direction indicated hy a secretiveness as to details of operations which it is a mistake to assume publicity would injuriously affect. Community of interest must start with a community of knowledge. There is no other hasis for it. It is as true of gold mines as it is of manufacturing industries and commercial husinesses. Gold miners must divest themselves of the idea that a community of knowledge of the gold mines is necessarily a community of interest in their ownership. Community of interest applied to the operation of the mines would tend to diminish what now appear to he impossihle difficulties. Ignorance is not a factor of safety in any husiness. Knowledge is. Let then the community of interest of gold miners hegin hy estahlishing itself on the firm foundation of community of knowledge of the gold mines. It is not to he denied that some small gains are made hy secretiveness. They should not obscure the fact that giving such small gains up opens the way for very much larger gains.

It is not to he inferred from the preceding that the community of interest should embrace all the gold mining industry in one organization controlled from one central point. It would be a disadvantage to carry the application of the idea to that extreme. The husiness of gold mining cannot he conducted at long range. It has to he done at the mines. Each gold mining district, or even each locality or camp, can he made most effectively the center for the application of the community of interest idea hy the gold mine operators who are directly interested in the mines of the district or camp. The study of the mines and mining of each district will determine the natural limits of the community of interest for that district. It may prove to he one or several of the operations which are common to all of the mines. In some districts it will he pumping, in others milling, in others again the providing of a water, fuel or power supply. An economy and saving can be made and waste avoided by a community of interest on the part of the mine operators in such operations.

Small Current Motor Dredger.

A Small Dredger.

The accompanying illustration is of a small gold dredger operated hy a current motor. The entire rig is light and novel in construction. In its special field for working very shallow stream gravels, where there is sufficient current to the stream to supply the power, it is claimed to do satisfactory work.

The dredger consists of two flat bottom scow hoats connected by a hinged platform, with the current wheel set hetween them. The wheel is connected up to the dredger mechanism proper which is set on two other flat bottomed scows with the bucket ladder set in between them. The two sets of hoats are connected by a hinged frame, the whole making a sort of catamaran structure.

The dredger buckets bring up hoth the gravel and the sluicehead of water with which it is washed, discharging hoth into a sluicehox. The wash, after going through the sluice, passes to an amalgamating table. The capacity of the dredger is claimed by the inventor, O. A. Petterson, who is operating one in the Colorado river, near El Dorado canyon, Nev., to he ahout 10 cuhic yards of gravel per hour in loose river bar gravel. One man operates the dredger.

Crusher and Mill, Free Gold Mining Co., Hedges, San Diego County, Cal.—(See Page 50.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 4 50

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

San Francisco, January 25, 1902.

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Oregon Mines.

Mining in Oregon has made a substantial permanent advance during the year 1901. The districts already well established, with Baker City, Sumpter and Granite as centers, increased their gold yield, and proved such an extent of new ground that a continuation of the increase of output can be looked for during the current year. Other districts just as well known, but from which less was expected, have made even greater relative advances. Josephine and Jackson counties, with Grant's Pass and Jacksonville as centers of development, have made notable advances toward the same permanent establishment of the gold mining industry that the first noted districts have already obtained. In these two counties, the first in which gold was discovered in Oregon, development has lagged by reason of the belief that gold values were entirely in shallow placers which were largely worked out. An increase of placer gold output during 1901 shows that this last supposition is not well founded. The notable feature of the late development is the extended working of the quartz ledges. Many new discoveries have been made, some of them appearing to be of very considerable magnitude. The little quartz mining of former years was largely a scratching of the surface for pockets. In 1901, however, many of these supposed pocket ledges were given deeper and more extended exploration and have through it become the beginning of permanent mines.

The area of possible gold mining was considerably extended during the year—not so much by entirely new discoveries as by the development of long known prospects which, unworked, were previously assumed to be valueless. The Blue River section in Lane county, lower Rogue river in Coos county, Malheur county, Union county and in the headwaters of the John Day river have all, from more or less discredited prospects, been proved to be at least possibilities. In some it is only a single mine so far, but that one is surely indicative of more yet undiscovered. All of these localities can be safely counted on as sure to make much more showing of potential value during 1902 than in the year just completed.

The discoveries and development of quicksilver deposits made in 1901 indicate a very considerable future for this branch of mining industry. The operations of earlier years with quicksilver mining in Oregon had not been encouraging and the older discoveries were unworked. The prospects of success with the newer ones is quite certain to cause a reinvestigation of the older ones, the failures of which were due to defective and costly methods of reduction, rather than to the failure of the mines to produce the anticipated quantities of the ore.

The presence of large deposits of copper ore in the extreme southwestern and the extreme northeastern corners of the State has long been known. Remoteness from existing transportation facilities had delayed development. In 1901, despite this adverse condition, considerable exploratory and preliminary work was done. The fall in the price of copper will very probably tend to defer development. The copper ores, however, carry considerable gold, which will be an incentive to their exploitation, even with the lowered price.

A possible mineral resource has been found during the year in asphaltum, and the discovery is being followed up by exploration for petroleum. Its discovery in Jackson county would assist materially in making the copper deposits available. In this connection there is much justification for investigation and experiment with novel processes for the reduction of the low-grade ores of copper, and the low-grade ores of nickel which exist in such great quantity at Riddles. There is no finality to the adverse conclusions from earlier attempts to beneficiate these ores which should lead to the abandonment of effort. It is within the last six months that the writer read in an Eastern mining paper a most elaborate mathematical and engineering demonstration of the commercial and technical impossibility of making iron from the ore direct by an electric current produced by water power. Within the last few weeks the statement is made that in northern Italy steel is being made direct from the iron ore by an electric current at a cost for the water power employed of $3.10 a ton. With such commercial results obtained under the most adverse conditions there should be no impossibility conceded with such valuable metals as copper and nickel to be recovered. There is no lack of cheap water power in Oregon.

A Secretary of Mines.

Congress is in session now. Of the two sessions of this Congress the present is the long session. There are always good reasons why little outside of the routine business of the Government is accomplished at the second or short session. The new matters that come up for constructive action by Congress have practically their only opening for consideration and action at this first and long session.

It is quite proper that right now should be put on Congress all the pressure that the interested mining industry has, to secure the creation of a Secretary of Mines and a Department of Mining. A bill has been introduced creating the office and the department. It should have the unanimous support of all members of Congress from mining States, and nearly all of the States are mining States now, and behind the Congressmen should be the individual support and insistence on action of the public who elected the Congressmen.

There is also a bill pending to create a Secretary of Commerce and a department for the office. From press reports this measure seems advancing toward final action. Its proponents, the commercial interests of the country, seem to keep their Congressmen at work on it aggressively. The business conditions of the country justify the establishment of the Department of Commerce, but to no greater extent than they justify the establishment of the Department of Mining. The forces that are moving for the one should be for the other. Both are desirable and should have common support in Congress. The Members of Congress whose constituents desire the Mining Department should not be backward about doing some real political missionary work on the Congressmen who have not yet sufficient light to see more than the Department of Commerce in prospective. Practically it should be easier to accomplish two desirable matters in Congress together, than to accomplish them separately.

The member of Congress from the Second California District in 1865—thirty-seven years ago—introduced a bill creating the Department of Mines. There is a suggestion of humor in the Congressman from the Second California District introducing a bill in 1902 to create the same department. The miners of the United States who elect Congressmen should not expect such long deliberation on an important matter. It is notable, however, that the principal objection urged against the creation of the Department of Mines is that the proposition is so novel that it requires a much longer consideration than it has had up to this time.

The farmers and commercial interests who want a Department of Commerce clearly do not intend to let grass grow on the graves of their Congressmen who first propose it, before getting what they want. The proposition may be novel, but they intend to consider and get it while it is novel and before it becomes ancient history written on tombstones.

Cost of Producing Copper.

The absence of a clear, intelligent statement of the cost per pound of producing copper, and how the cost is made, is still noticable in the press discussion of copper mining. The effect of the absence of such a statement is the making of a bad matter worse. It is a depressing force on copper mine values. The cost per pound of producing copper is practically dependent on the number of pounds of copper in the ton of ore that is mined and reduced. In very few mines is the copper so uniformly distributed in all of the rock matrix that a segregation of the ores in the mine into rich ores and poor ores is impracticable. In most mines a segregation can be made. A ton of ore yielding 100 pounds of copper costs no more to mine than a ton of ore yielding only fifty pounds of copper, and costs but little more to obtain the metal from it. The pound cost of copper with 100 pounds of copper in a ton of ore is then about one-half the pound cost of copper with only fifty pounds of copper to the ton. Some mines can adjust their operations to the change in price and continue to make a profit on production by simply changing the grade of ore mined. Whether or not it is good business policy to so operate a particular mine is a question that the mine owner must determine. The value of a copper mine is certainly diminished with a lower price for copper, even though its present profits be kept up by mining higher-grade ore. The leading question, however, requiring answer at the present time is what will the average sale price of copper be for, say the next two or three years. The most successful mining of copper during this period will be based on what proves to be the closest estimate of this price. Between the blocking out of the copper ore in the mine and the marketing of the copper to consumers the time interval is anywhere from six to eighteen months—the higher limit in large mines and toward the lower limit with small mines. A mistake in estimating the future price of the metal when blocking out the ore will affect the profit earning from it. Some custom smelters missed a correct estimate of the future price in buying ores, paying 75% of the current 17-cent price down and holding back 25% till the copper was marketed. Copper has dropped 35% uncovering the margin.

THE U. S. Geological Survey Report on the production of Portland cement in this country in 1900 notes that the quantity of imports of it remains about the same as for several years preceding despite the continued increase in domestic production and a large lowering in price. These imports are for the larger part into the Pacific Coast States, none of which are producers to any marked extent. Domestic Portland cement sold at an average of $1.09 a barrel with a constantly increasing production, indicates a good commercial profit in the business, which requires large capital investments in plant. The sale price of the imported Portland cement in the Pacific States at the ports of import varies with supply and demand but has seldom been below $2.75 a barrel. It seems as though it would be hardly necessary to point out the practically clear field for investment in Portland cement manufacture on the Pacific coast that would be sure to return a large profit. In proportion to population no section of the country is such a large consumer of Portland cement as the Pacific coast. With the lower prices that domestic manufacture would bring the consumption would be enormously increased. Portland cement is a manufactured product, the new raw materials for which are not monopolized by any section of the country. They exist in the Pacific Coast States over considerable areas and can be assembled very cheaply. There are certainly commercial possibilities in Portland cement manufacture here which should not be overlooked, particularly as the only competition that it will have to overcome is imported cement, which is handicapped by freight charges alone exceeding the cost of domestic manufacture.

Concentrates.

AT a temperature of 150° F. 5 cubic feet of water will weigh 305.8 pounds.

SULPHUROUS acid boils at 16° F.; hydrofluoric acid, 68°; ether, 95°; chlorform, 142°.

A COMPLETE practical treatise on gold milling appoarcd in tho issue of this paper of Dec. 1, 1900.

MULTIPLY the diameter of the wheel in inches by .2618: the product will be its circumferonce in feet.

MOST assuredly, "if gold can be separated into copper and load," these metals can be combined to make gold. But it can't.

TO TRANSMIT 100 H. P. with a belt ⅝ inch thick, running at 1800 feet per minute, the belt should be 17½ inches wide.

A ZINC ROD ⅝-inch in diameter, a carbon plate, and a saturated solution of sal-ammoniac in a glass cell constitute a simple electric cell.

STEEL reaches the greatest tenacity with about 1% of carbon; as the carbon departs either way from this quantity the tenacity diminishes.

MAGNETIC IRON ore bodies can be located, using the magnetic needle. A special form of instrument is employed, called the dipping needle.

CALCIUM CARBIDE is now made by fusing 100 parts of lime and 70 parts of coke in an electric furnace. A temperature of 27,000° C. is required for its formation.

A DYNAMO can be run in either direction by simply changing the position of the bushes so they will not catch the edges of the segments in the commutator.

HUBERNITE has a commercial value of about $200 per ton. It is used in tempering steel, and the market for it is in the manufacture of ordnance and armor plate.

AN engine having a cylinder 9x12 inches would raise one ton of ore in a car weighing 650 pounds a distance of 250 feet in one minute, the cage weighing 900 pounds.

CARBON can be melted or fused and vaporized, but it becomes carbon again when it cools. It is necessary to have enormous pressure in the case to produce diamonds.

WHERE tho weir opening of a flume is 72 inches wide, and the depth of water flowing over the weir is 5½ inches, there flows over 346.44 cubic feet, or 2591.4 gallons, per minute.

OF all materials yet examined fused silica is that which expands least by application of heat; rods or tubes of fused silica can be made red hot and plunged into cold water without being cracked.

THE weight by which diamonds and other precious stones are valued is the carat. One carat equals 205 milligrammes or $3\frac{1}{3}$ grains; one troy ounce equals 31,103 milligrammes, or 152.72 carats.

THE Betty-Carter electrolytic cyanide process is a zinc-lead couple formed by immersing zinc in a lead acetate solution, coupled with strengthening the solution in cyanide before entering the zinc boxes.

BOILER steam at 100 pounds gauge pressure has a temperature of 338° F. The evaporation of nine pounds of water from and at 212° per pound of coal burned, corresponds to a boiler efficiency of 70%.

THE market price of 80% ferro-manganese is $53.50 in large lots at Pittsburg. Ferro-manganese is made at the Carnegie works of the United Steel Co.; spiegeleisen by the Colorado Fuel & Iron Co., Pueblo, Colo.

SO FAR there is no determined limit to the distance that compressed air can be carried. Air has been utilized at a distance of 5 miles from the compressor. Friction in the pipe is the chief source of loss in transmission.

IN the impact turbine the ideal condition is when the peripheral velocity of the buckets is one-half that of the fluid comprising the jet. In the reaction turbine this velocity must be equal to that of the jet in order to give that ideal condition.

GASOLINE ENGINES, owing to the intense heat generated in the cylinder by the explosion, require a higher grade of cylinder oil than do steam engines. A 30 H. P. gasoline engine will use about 300 gallons of water per day. A steam engine of the same power would require 3000 gallons daily.

TELLURIDES may be cyanided or chlorinated, but must first be roasted. Rich tellurides are sometimes treated by means of sulphuric acid, which dissolves the tellurium, this substance being afterward reprecipitatod and collected, the gold subsequently obtained from the residues by smelting.

A WATER SUPPLY of 50 inches of water to run a 5-stamp mill, rock breaker, concentrator and feeder would have to be used under 100 feet head or pressure. This would necessitate a water wheel of the turbine or other type. An overshot wheel could not be used, as the diameter would have to be too great.

THE sag of a belt which should be allowed when it is first put on, and when it is being tightened later on, may be found by multiplying the decimal .0165 by the distance between the centers of the shaft in feet. The product will be the sag in inches under ordinary conditions. Where the distance is 20 feet the initial sag would be $20 \times .0165 = 3.3$ inches.

THE U. S. Circuit Court in an Alabama case has ruled that the miner assumes the risk of the tools furnished him by the mine operator and cannot recover damages for injury resulting from their use. The miner in this case was injured by the premature explosion of dynamite which he was tamping with an iron rod furnished for that purpose by the mine operator.

HYDRAULIC MINING is not "prohibited" in California. In the central portion of the State that branch of gold mining is under government restriction, but even in the area affected by such regulations there are nearly 250 mines working under permits obtained from the Government Debris Commission. On all streams not tributary to navigable waters the work goes on without restraint.

TO DETERMINE tho point in the stroke at which cut-off must take place in order to expand the steam to a given pressure, divide the terminal by the initial pressure; the quotient will the point of cut-off in decimal parts of the stroke. If the initial pressure is eighty pounds, and it is desired to securo a terminal pressure of twenty pounds, the cut-off must take place at $20 \div 80 = .25$ of the stroke. Both pressures are absolute.

LESS than 1% of the weight of petroleum remains as ash after combustion; the ratio of ash in coal is 5% to 10%. Petroleum can be burned under any kind of boiler, and its use may alternate with that of coal. To apply the petroleum it is only necessary to introduce a pipe carrying it and another pipe with compressed air or steam into the furnace, and arrange suitable nozzles to insure a mixture of the oil in a finely divided state with the air or steam.

A PATENT can be obtained for a placer claim with a hot mineral spring on it. The patent expressly reserves such springs from the grant where they are salt springs, but it is doubtful if the reservation has any force. The last ruling of the Land Department is that lands containing mineral springs not of a saline character are subject to sale under the agricultural land laws. Sulphur springs are not regarded as saline. A mineral spring can not be located or claimed as a placer.

SEVEN men, each owning a placer location of 20 acres, must do $100 assessment work on each location. If they have consolidated the locations so as to become owners in each they can perform $700 of work on one location if they so elect and it is assessment work for all of the seven locations. If the seven men take the seven claims of 20 acres each in one location of 140 acres, only $100 worth of assessment work is required. In every instance the location is the claim when assessment work is considered.

TO state "the requirements for an assay office supply" is not easy. So much depends. Assuming that the apparatus is provided, the assayer through the year would probably find use for crucibles, coke, coal, oil cloth, stationery, turpentine, belting, sieves, borax, litharge, niter, muffles, brooms, asbestos sheeting, gold pans, brushes, coal oil, moisture scale, nitric acid, alcohol, C. P. silver, funnels, filter paper, potash, samplers, cupel machine, bi-carb soda, sample sacks, red bricks, basins, shovels, bone ash, nails, pans and twenty other little items according to place and circumstance.

THREE of the principal ways usually adopted in mine surface sampling are, from the trucks to the mill; from the cam-floor shoots; from the feeders. Each of the three ways has its adherents. The chief objection to the first is the large quantity necessarily taken, to the second the tendency to have too much coarse rock in the sample, in the third the probability of there being too high a result. Quartering down, screen samples and pulp leaving the mill are also in favor among mill men. Automatic sampling in any and every case is considered superior in accurate results to hand sampling.

PROSPECTORS and traveling miners can use the automatic method of developing photographic plates, as it obviates all carrying of chemicals. Each plate is coated on the back with a prepared solution, and the development can be carried out in water slightly alkaline. The solution is composed as follows: Pyrogallic acid, 10 grammes; salicylic acid, 1 gramme; dextrine, 10 grammes; alcohol, 4 C. C.; water, 20 C. C. This solution is spread upon the back of the plate and allowed to dry. The exposure is made as usual, and, to develop, it is but necessary to put the plate in water, to which a few drops of ammonia have been added. The coating dissolves, and the developer is thus prepared.

WHETHER a dead animal body, lying on the bottom of a river, lake or pond will rise is a question of specific gravity and not of the sole efficacy of firing cannon to cause such body to come to the surface, though if the stomach of the body be intact, the body but little mutilated and the period of immersion sufficiently long to evolve gases of decomposition, its specific gravity is leslened to such a degree as to cause its detention on the bottom to be largely due to molecular attraction, and in that case any disturbance of the water, even by vibration occasioned by discharge of cannon, would have a tendency to disturb such adhesion, causing the body to rise to the surface.

THE grade of a ditch depends in some degree on the kind of ground through which it is made. Ordinarily, water should flow at the rate of from 180 to 200 feet per minute. The diameter of the pipe does not determine the pressure; this last is proportional to the head. A pipe line of 6-inch or 36-inch pipe with the same fall or head will each give the same pressure. Theoretically, the water forced through a nozzle should be able to attain the same height as the head; but in practice it will fall short. The friction of water in pipes increases as the square of the velocity, and is also largely determined by the condition of the pipes, whether old or new, clean or foul. With a sluice having a grade of 1 foot in 20, 40 miners' inches (60 cubic feet) per minute should wash 150 cubic yards every twenty-four hours.

REGARDING heating or warming of cyanide solution practical cyanide experts have found that warming the solution has very little beneficial effect, unless the solution falls below 45° or 40° F., in which case it loses its efficiency; as long as the solution is kept above this point the results obtained are regular; if too much heat is given to a cyanide solution and no "protective alkali" is present, hydrocyanic acid gas is evolved, which is really the life of the solution. Thus too much heat is to be avoided; by keeping the cyanide solution at about 72° F. the best results are obtained, but where the temperature of the buildings keeps the solution at from 50° to 70° F. no advantage can be otained by heating to 72°, for the expense of such heating overreaches the advantage in extraction, which is in itself very small. Calculating only 2% gain in extraction by raising the temperature from 50° to 72° F., the labor, fuel and apparatus involved in heating would leave no advantage in doing this.

GEOLOGICALLY, ore bodies are, ordinarily, secondary formations. With some exceptions, they have accumulated long after the country rock has been formed. While it has been widely recognized that close relationships exist between the formation of most ore bodies and the character of their matrix, the vastly broader generalizations regarding the intimate association of ores with geological structures have received less attention. The exploitation of ore bodies is often carried on in accordance with rules which the limited experience of the individual has pointed out. Where an operator untrained in scientific mining begins in an undeveloped mining district, his method of attacking the various problems presented is likely to be after that of his nearest observations elsewhere. He may hit upon the right plan of work at once, but the chances are that he will not. Only after repeated trials and failures, and after much fruitless expenditure of time and energy, does he finally reach satisfactory results. When, however, a specially trained geologist undertakes to make an investigation of a mining property, he, first of all, gets his bearings, as it were, with regard to the geological structure of the region and the distribution of the rock formation, and eliminates nine-tenths of the chances of failure in arriving at the best plan of operation. Instead of a great game of chance, the development becomes a strictly business proposition. These two methods of procedure indicate the essential differences between old and new ways of carrying on mining operations. The intelligent exploitation of ore deposits must have a broad geological basis.

NO PRESSURE per square inch indicates a horse power. The number of horse power, mechanical horse power, (M. H. P.), in water from a 6-inch pipe, with the inlet 100 feet higher than the outlet, is not practically determined from the water pressure at the outlet, but from the weight of water passed through the pipe in one minute multiplied by its fall in feet and divided by 33,000. The M. H. P. could be determined by multiplying the pressure per square inch by the number of square inches through which the water is discharging, multiplied by the velocity in feet per minute divided by 33,000. The first described method is employed because it is a simpler and more direct calculation. It is easier to weigh accurately the water than it is to measure accurately its velocity of discharge from the pipe. With gases—for example, steam—it is simpler and easier to measure the velocity and pressure than it is the weight; therefore, is used a different rule, though the fundamental rule on which both are based, the law of mechanical energy, is the same for both estimations. In determining the M. H. P. of a water power, first determine the volume of the water used, or proposed to be used, in cubic feet per minute, and multiply this by 62.4 to determine the number of pounds per minute. Next divide the number of cubic feet of flow per minute by 60, to determine the number of cubic feet per second, and divide this by the cross-section area of the pipe in square feet. The quotient is the velocity in feet per second of the water flow. In the November 23, 1901, number of this journal is a graphic table prepared from Weisbach's formula of the flow of water in pipes. The next step is to use this table. On the right hand side of the table take up the lines of diameter of the pipe and velocity of flow just found and follow them to their intersection. From this intersection follow the nearest horizontal line of the table across to the left hand, and the number found there will be the friction head of 100 feet of pipe, or the number of feet fall that the pipe must have to make the water overcome the resistance to the flow offered by the metal of the pipe for 100 feet length. Multiply this friction head per 100 feet of pipe by the number of hundreds of feet and decimals, and the product is the total friction head of the pipe. Add 1 foot to this total friction head, if the velocity is less than 6 feet per second, which it should be, and 3 feet if it is 12 feet per second. For higher velocities, refer the problem to an engineer or plan a bigger pipe. Subtract the sum just obtained from the difference in elevation between the inlet and discharge of the water or the total head. The difference so obtained is the real head of the water. Multiply the number of pounds of water first obtained by this head and divide by 33,000, and the quotient is the theoretical M. H. P. How much of this can be had as work depends on many mechanical details. It can be as high as 80% and may be as low as 40%. It is a good plan to assume 55% in preliminary estimates.

Meadow Lake Mining District.

Written for the MINING AND SCIENTIFIC PRESS by CHARLES W. RAYMOND, M. C. E.

After an interval of more than thirty years the mining district of Meadow Lake, Nevada county, Cal., seems to he coming to the front once more, and if the continuation of the work for the past eighteen months produces the results indicated this district will undoubtedly become a producer of gold and once more a noted mining camp of California. Meadow Lake district has long heen discredited. Many explanations have heen given and none have heen favorahle enough to suggest its reinvestigation. All on the contrary have tended to give it a most hlackened reputation. It has heen a "had example," a warning to would-he investors to keep away from the district and even out of gold mining. It has heen said to he a district of "ill defined veins," "of no depth," "with no values," a climate severe heyond imagination, "inaccessihle," and the ores of which, even did they contain values, unworkahle, because of their rebellious and refractory nature.

The U. S. Geological Survey has mildly recorded its adverse opinions. It is briefly referred to in the Truckee Folio, under date of January, 1898, and Colfax Folio of April, 1900, which read, "a few ill defined veins carrying auriferous sulphides only have been found." "Scattered veins * * * and * * * a vein system of some importance, though not very rich, is found in the vicinity of Meadow Lake and Old Man mountain."

And on looking over many mining reports deprecatory mention is made of this district in stock phrases, "veins in granite," "rebellious," "refractory," "honeyard of processes," "difficult of concentration," "a camp marked by unsuccessful attempts to profitably work its ores, which carry low values, and little gold, and located in a section offering poor transportation facilities, rigorous winters," etc.

That this reputation is undeserved; that the veins and vein systems are well defined and important; that the ores carry gold values and often are high grade; that these values can he extracted and without any complicated or expensive process; that the district presents no adverse climatic conditions at all, hut has an exceptionally delightful climate eight months of the year; that transportation facilities are very good and can easily he made hetter, and that, in fact, the Meadow Lake mining district does offer excellent inducements to investors as a profit-paying mining camp, will he the effort of the writer to show. The old repute of the district is really of that nature which can he described as the effect on the dog of giving it a had name. It would he easier to accept the consensus of adverse opinion which involved no responsihility or risks to reputation than to make a contrary one which involved responsihility, risk of reputation, and, it might he added, conscientious work on the ground.

Meadow Lake mines have had a long rest. They are awakening from a sleep of thirty years with new and hetter prospects. With the assistance of the experience in the handling and working of mines and ores gained in the interval, the old descriptions as "low grade," "rebellious and refractory," no longer truly describe the conditions. The present conditions make the district an example of what the MINING AND SCIENTIFIC PRESS so appropriately has described as the "Renaissance of the old mines."

While the history of Meadow Lake adds nothing to its commercial value in this later time, it is a most fascinating tale of the intense feverish energy which marked the culmination of the mining activity in the West. It was huilt on the success of the near-hy Comstock lode development and out of the surplus of attention which it was then receiving. It was for a time supposed that it would be another Comstock.

The first work in the locality was the construction of the Meadow Lake reservoir hy the South Yuha Ditch Co. in 1856. This work was done to provide a continuous water supply to the placer mines at Dutch Flat, Little York, You Bet and Red Dog, which were located 30 miles or so westward. The huilders of the reservoir missed the discovery of the gold-hearing ledges, which were close to the site of the dam they constructed. Five years later, in June, 1863, the first discovery of gold-hearing ledges was made hy Henry Hartley. Hartley, it seems, observed a number of ledges traversing the country ahout three-quarters of a mile from Meadow lake. In Septemher of the same year, with two prospectors, John Simons and Henry Feutel, Hartley made the first mining locations, locating 2000 feet on each parallel vein, naming them Union No. 1 and Union No. 2, forming part of what is now known as the Excelsior group. These ledges are traceahle northwesterly and southeasterly fully 1 mile, the bedrock showing hare for thousands of feet in all directions, there heing no surface covering, except in low hottoms and higher up on the flat slopes. The quartz on the surface is stained a dark reddish hrown hy the oxide of iron derived from the gold-hearing pyrites. In many places the decomposed pyrite was filled with fine gold. Every experiment these prospectors made with their pans and horns added to their first impressions of the richness of their discovery.

This company was the only one in the district until the summer of 1864, when the California Co. discovered and located the California (now the Century), the Knickerhocker (now the Hercules) and two others. These locations covered 1700 feet on each of four very prominent ledges.

In the summer of 1865 puhlic attention was attracted to this camp and the first movement towards it was from Virginia City, Nev. Rumors had reached that place of rich prospects struck on the summits of the Sierras and of vast ledges showing anywhere on their surface free gold. From June, 1865, until late in the fall of 1866 hundreds stampeded to the new district. Cahins were built on the shore of Meadow lake and the place became known as Summit City. At the first miners' meeting, held in July, 1865, boundaries for the new district and the name of Meadow Lake were adopted. Stakes with notices rapidly covered the country, and every mass of rocks which hore the slightest resemhlance to a ledge was claimed and located. Fully 1200 locations are said to have heen made during the summer of 1865, containing in the aggregate more than 1,200,000 feet of ledges. At this time Meadow Lake was surveyed and laid out as a town. Lots were sold at $25 each. Before the winter of 1865-66 set in more than 150 houses had heen huilt, and a city with stores, saloons, three hotels, gamhling houses, hank, hrewery, two daily papers and an express office was estahlished. In the spring of 1866 the town was incorporated as Meadow Lake. It is estimated that over 3000 people visited the district during the summer of 1865, creating a season of transient prosperity.

Among the many locations made, several of more than ordinary richness were partially developed and worked, with such facilities and knowledge as the times provided. These yielded profitahle returns, the ores showing values ranging from $20 to $100 gold per ton. Very little work other than what was necessary to hold the claims was done on the other claims during that year. Winter drove out the crowd, about 200 persons remaining through it.

In May, 1866, the rush started in again, and by the end of June fully 4000 people had visited Meadow Lake. The excitement was intense. Town lots were held at $1500 to $2500, and in some cases actually sold at the latter figure. Small houses rented as high as $200 per month. There were four saw mills in the district and lumber sold for $50 to $75 per thousand. During July four or five hundred frame houses were erected, some of them handsome and suhstantial. In June a stock hoard, with thirty-nine memhers, was estahlished. The excitement in the district was, however, short lived. A reaction followed, and the district experienced a decadence as rapid and quite as unreasonahle as its rise. A few men went to work persistently on their claims. Four good roads were opened. One to Bowman's station on the South Eureka hranch of the Henness Pass; another to Jaction; a third to intersect the main Henness Pass at a point near Weher lake, and the fourth to Cisco, then the terminus of Central Pacific R. R., 11 miles distant, bringing the district within a day's ride of San Francisco. From Meadow Lake to Truckee, via Weher lake, the distance is ahout 33 miles over an excellent mountain road.

Development work continued on some thirty claims and depths of 20 feet to 200 feet were reached. Several mills were erected and one or two roasting works, also a small chlorination plant. The surface ores were oxydized and yielded the gold to a fair degree. Arrastras were worked successfully. The ores were milled in the simplest manner; amalgamation was performed in the mortars and blankets were used to save such values as passed through the screens; the tailings were passed on to the tailings dump. Concentrating machinery was practically unknown in those days, and it was a prohlem among the millmen how to get rid of the metals which interfered with the amalgamation. In this district the millmen came from the State of Nevada and their knowledge was derived from experience in the milling of silver ores.

When the oxydized and readily amalgamahle ores were worked out in the several openings under way the sulphide ores under them would not yield values to amalgamation. Sulphurets containing hy assay $50 to $60 gold per ton yielded scarcely anything. The ores were declared to he "rebellious," "refractory," "hase"; the gold, it was said, was coated with some transparent varnish-like or invisihle material which prevented amalgamation, and that the ores could only he worked by some unknown and to he discovered process. New machinery was erected, mechanical and chemical experiments were installed, and Meadow Lake became a honeyard of processes, the failure of each adding another confirmation to the already declared opinions. Repeated failures rapidly drove the population away. It went as from a plague and left hehind it all its goods and chattels. For twenty years and more afterward the town of Meadow Lake stood deserted, the houses with their furniture, mills with their machinery, all ahandoned, and the common property of the few cattle herders and campers who went in every summer. One man, Hartley, the original discoverer, remained in the old deserted camp with unshaken faith in its ultimate success. During this period Hartley, with a 10-stamp mill on the Excelsior mines, made some successful runs.

In 1895 Bruner & Hirsch leased the Washington mine on Old Man mountain. They installed an aerial wire cahle, 2650 feet in length, from the top of the mountain to the foot at the little camp of Carlyle. The cahle line was poorly erected and failed to accomplish its purpose in time hefore the lease expired. However, they shipped several carloads of ore which, while it was an expensive method on account of transportation expenses to the smelter, more than paid expenses.

In 1898 Messrs. Giffen, Butt & Gay hegan working on the Pennsylvania, at Carlyle, and instead of attempting to ship ore or to employ some complex and expensive method of ore reduction, they made careful and thorough tests, the results of which proved conclusively that wet crushing, good clean plates and first-class concentrating machinery would save the values in the ore.

They organized the Girard Mining Co., and in the summer of 1901 they erected an 8-stamp mill, using part of the machinery of the old Grant mill. The power was obtained from the Fordyce creek. Silver-plated plates were put in and a Wilfley concentrator installed. The summer's work with this mill showed a recovery of $18 per ton, with final tailings assaying 50 cents to $1 per ton. The yield from the plates was $5.25 per ton, the remainder of the value being in the concentrates, which assayed from $50 to $60 per ton. The ledge from which this ore was broken runs from 6 feet to 13 feet wide, and everything hetween walls was milled. Much of the ore was unoxidized. This company intend during the coming summer to reconstruct their mill, putting in ten stamps and a cyanide plant, as they have found the concentrates can he profitahly treated hy that process.

In 1897, Capt. E. O. C. Ord and associates organized the Crystal Lake Gold M. Co. This company in 1900 made an exhaustive investigation of the various lodes from Meadow lake on the east to Old Man mountain and Red mountain on the west, covering a width of ahout 4 miles and extending as far north as Baltimore and to Fordyce lake and Red mountain on the south. The investigation embraced in detail the character of the ledges, the gold and other values contained, the percentage of concentrates; and ore taken from ledges widely separated was shipped for smelting and mill tests. The results in every case showed that gold values were in the ore, and that they could he readily and profitably extracted from hoth the ore and the concentrates. Further tests were made to ascertain to what extent the ores could he treated and the gold extracted hy chlorination and hy cyaniding. The results of the latter were in the main satisfactory.

The Crystal Lake G. M. Co., since the conclusion of these investigations, has installed a 10-stamp mill on the Excelsior group of mines, completing it ahout the 1st of Decemher, 1901. The mill machinery was huilt hy the Risdon Iron Works of San Francisco, and consists of ten 950-pound stamps, Barbour patent cams, one Blake 8x12 rock crusher, 12 feet silvered apron plates, holster and hack mortar plates, one 72-inch water wheel for hattery, one 18-inch water wheel for concentrators, one 24-inch water wheel for ore hreaker, two 6-foot Johnson concentrators.

The power is ohtained from Meadow lake, the water going to the mill through ahout 4700 feet of 12-inch and 14-inch riveted steel pipe, under a head of 250 feet. The mine is well equipped for winter operations. An air compressor is installed, operating one large and two "haby" machine drills. The track from shaft and crih to mill, ahout 200 feet, is housed over.

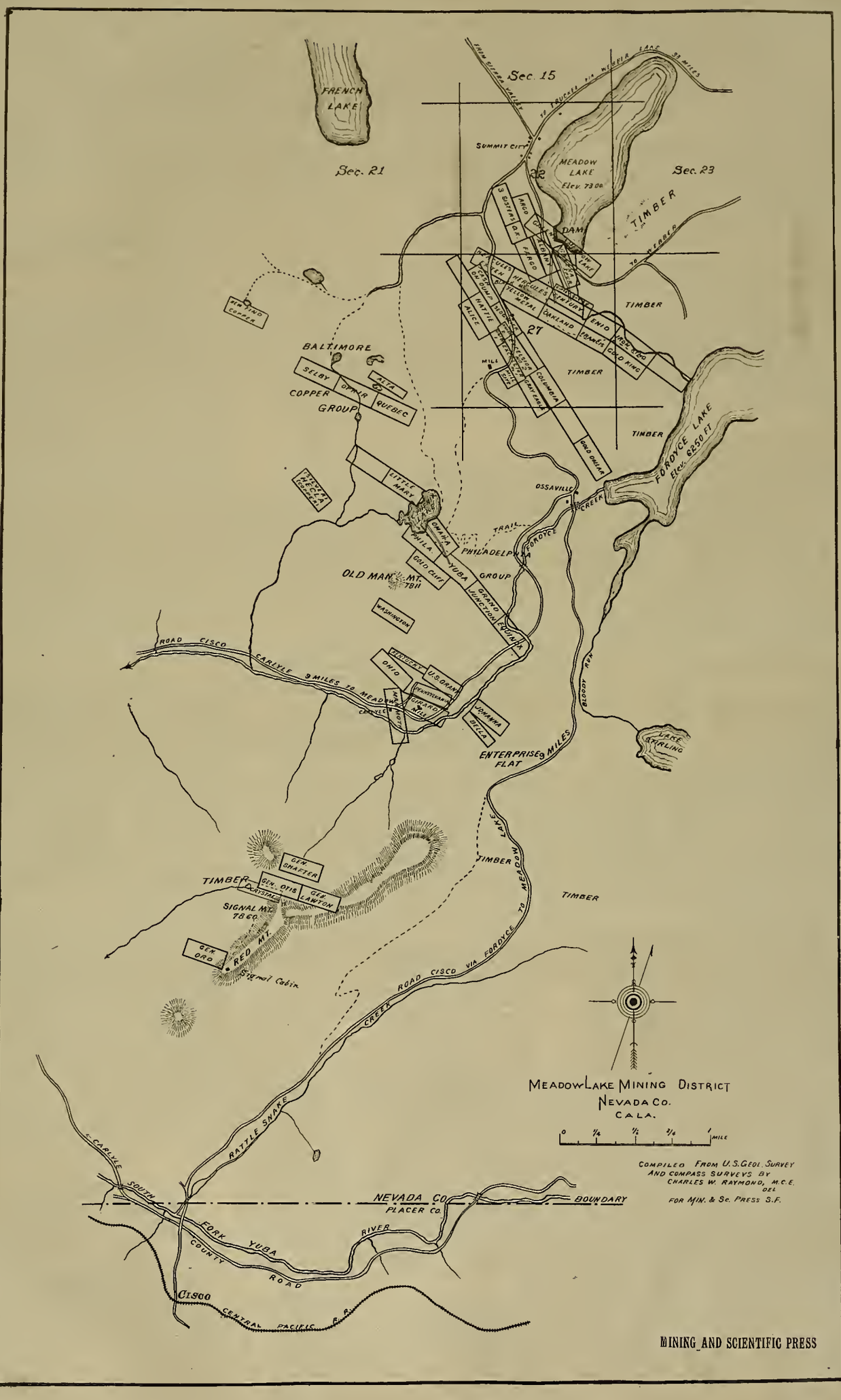
The company started a shaft near the mill, and for the first 25 feet or more the ore showed values of over $25 per ton gold. In the tunnel now heing run to tap this shaft ore has heen encountered which assays $30 to $50, and fine specimens of free gold have heen taken from the ledge. The mill has been running ahout three weeks, and is crushing fully two tons per stamp, or over twenty tons per day.

In connection with the milling plant of the Crystal Lake Co., operations for the erection of a 50-ton roasting or oxidizing plant are under way and will be completed in the spring. Crude petroleum is to be employed. Tests made on a 6-ton lot of ore from this district showed after roasting an increase in the amalgamation extraction of 25%.

The Three Sisters mine has a quartz vein fully 6 feet wide, in which much free gold appears; samples from a 6-inch to 18-inch streak assayed $199.27, and frequently 50 cents to $2 per pan are ohtained.

The Fargo, a southeasterly extension of the Three Sisters, shows a well defined ledge, varying from 4 feet to over 6 feet in width. The sulphides are disseminated through a sugary quartz matrix; galena is not infrequent. There are two shafts on the property—one 85 feet and one 90 feet deep. Several lots of ore shipped from the cut near the 90-foot shaft yielded $19.60 gold per ton. About 1500 tons of ore on the ore dump will yield fully $10 per ton, and, heing well oxidized, prohably 65% can he saved on the plates.

The Argo mine shows a strong vein, averaging 4 to 8 feet wide, well mineralized, and assays over


FRENCH LAKE
Sec. 15
Sec. 21
Sec. 23
SUMMIT CITY
MEADOW LAKE
Elev. 7300
DAM
TIMBER
BALTIMORE
COPPER GROUP
SELBY
ALTA
QUEBEC
ARGO
ALICE
HATTIE
OAKLAND
ENIO
COLUMBIA
GOLD KING
TITTLE MARY
OMAHA
PHILA
GOLD CLIFF
YUBA
GRAND JUNCTION
EQUINOX
OLD MAN MT. 7811
WASHINGTON
OHIO
U.S. GRANT
KENTUCKY
BELLA
FORDYCE LAKE
Elev. 6250 FT
OSSAVILLE
CREEK
TRAIL
FORDYCE
BLOODY RUN
LAKE STERLING
ENTERPRISE 9 MILES
FLAT
ROAD CISCO CARLYLE 9 MILES TO MEADOW LAKE
GEN. SHAFTER
GEN. OTIS
GEN. LAWTON
SIGNAL MT. 7860
RED MT.
Signal Cabin
GEN. ORD
TIMBER
CREEK ROAD CISCO VIA FORDYCE TO MEADOW LAKE
RATTLE SNAKE
CARLYLE
SOUTH
NEVADA CO.
PLACER CO.
BOUNDARY
FORK
YUBA
RIVER
COUNTY
ROAD
CISCO
CENTRAL PACIFIC R.R.
MEADOW LAKE MINING DISTRICT
NEVADA CO.
CAL.
0 1/4 1/2 3/4 1 MILE
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$10 per ton. The Galena mine is distinctive in having the only lode which carries galena ore in any quantity. At the shaft near the dam the galena is massive, 4 to 14 inches wide, accompanied hy a strata 10 to 18 inches wide, showing galena and zinc-blende. Assays from this lode show 8% concentrates; value, $44.75 gold and twelve ounces silver per ton.

The Fargo vein intersects the main, or Century, vein at the southeast end of the Hercules claim, and this lode probably intersects the Excelsior system, 4000 or 5000 feet northwest.

The Iron King lode seems to he a strong and promising vein. At the large cut, near the southeast end of the Hercules, ahout 200 feet of the ledge has been mined out from 3 feet to 15 feet deep, and is 6 to 20 feet wide. Ore from this cut, where the pay is over 5 feet wide, assays $19.50 gold, and from another place in the cut $9 gold. On the dumps of the several openings there are about 2000 tons of ore, much of which is well oxidized and will assay over $10 per ton.

On the Century, owned hy Clark & Cook, the ledge shows larger values. At times copper is present as high as 10%. At the shaft the ledge is over 10 feet wide, and at the bottom of the shaft—about 20 feet deep—gave $9 gold, $1.40 silver; total, $10.40 per ton. About 30 feet helow the shaft is a cut ahout 15 feet deep. Samples yielded over $55 gold, and rich pockets of free-gold specimens have been found several times. In October, 1901, one panful is said to have yielded over $1000 gold. Ore from this cut has been run through ordinary sluice hoxes with riffles and paid well.

In a mill test on ore from Century shaft and cut dump, a sample assayed: Gold, 2.187 oz., value $45 21; silver, 2.77 oz. at 60 cents per oz., value $1.66. Total, $46.87 per ton. Ore crushed and amalgamated and yielded at the rate of: Gold, 1.45 oz., value $29.97; silver, .70 oz., value 42 cents. Total, $30.39 per ton, or 64.8% of the assay value. Tailings were concentrated and gave at the rate of 410 pounds concentrates per ton of ore, or 20.5%. The concentrates assayed: Gold, 2.47 oz., value $51.74; silver, 3 35 oz., value $2.10. Total, $53.84 per ton. The 410 pounds of concentrates are worth $10.91, which is 23.2% of the assay value of original ore. Final tailings assayed: Gold, .29 oz., value $6.02; silver, 1.45 oz., value 87 cents. Total, $6 89 per ton. The total extraction was: By amalgamation, $30.39, or 64.8%; by concentration, $10.91, or 23.2%. Total extraction, $41.30, or 88%. Two other tests on ores from the Century and Hercules claims gave in general the following results:

Samples.	No. 1.	No. 2.
Assay	$20 67	$13 60
Extraction by amalgamation	14 50	8 20
Extraction from concentrates	4 37	3 65
Total extraction	18 77	11 85
Tailing assay	1 90	1 75
Percentage of total recovery	90	86.7
Percentage of recovery on plates	77	69

West and south of Black mountain are the ledges which form the system known as the Excelsior system—a perfect network of veins and spurs which, like all in the district, are visible and easily traceahle for thousands of feet. The character is about the same, although the general course varies somewhat from that in the Meadow lake, or, more particularly, the Century system, the former running more nearly northwest and southeast. These ledges cut the formation at an angle, the strike of the formation heing generally nearer east and west.

The claims in the Excelsior system are shown on the map. The ledges are very strong, well marked with well-defined walls and are quite wide, averaging 4 to 8 feet, and in some places are more than 30 feet. The sulphurets are ahundant and disseminated through the quartz. The country rock formation is the same as obtains throughout this section of the district—igneous and metamorphic. Grano-diorite, hornblende and gneiss are prominent. The veins contain 10% to 20% of sulphides, mispickel, magnetite, some zincblende, considerable iron pyrite and traces of copper. The gold is granular to fine, and apparently evenly disseminated through the matrix. The ore concentrates easily, but it is not easy to hand-sort it. Rich ore is found in many places, and free gold quite frequently shows plainly in the quartz.

On the Cash-on-the-dump the vein will average 6 to 7 feet and in value from $10 to $15 per ton. Very much higher values have been obtained. About 1200 tons of good ore are piled up on the dump alongside the road. This is one claim in a group of four—Cash-on-the-dump, Sedgwick, Hattie and Alice.

The Gold Dollar is farthest down on the ledge and near Fordyce lake. Little development has been done; one shaft, about 10 feet deep, at the center of the claim, about 600 feet higher than the level of the lake, shows a very strong and well defined ledge over 8 feet wide, with a pay shoot 5 feet in width; of this, 1½ feet is a rotten, oxidized gangue and quartz mixed, assays $48.67, and pans well in free gold; the remaining portion of the pay, 3½ feet, is solid, a good character of quartz, the sulphurets disseminated. The average of the whole 5 feet assayed gave $16.50 gold per ton. Like a majority of the ledges in the district, it can be made to yield returns almost from heginning of operations, requiring but little dead work in opening up the ore body.

The Gray Eagle and its southerly extension are located on a portion of the ledge, which shows a remarkable degree of mineralization throughout the length of the lode where exposed, and a width of vein 6 to 20 feet.

The Excelsior, Nos. 1 and 2, and Union, Nos. 1 and 2, are the hest developed in the vicinity, and are prohahly the strongest and, so far as known, show the highest values. These are the properties first discovered hy Hartley and now being worked by the Crystal Lake G. M. Co. Union No. 1 contains 500 linear feet of lode; Excelsior No. 1, 1500 feet; Union No. 2, 500 feet; Excelsior No. 2, 1500 feet. The ledges are nearly parallel and ahout 80 feet apart. Between these ledges and on either side a network of spurs exist, crossing and springing from the main ledges in many places, all well mineralized and carrying varying values. The ledges are visible on the bare rocky surface the entire length of the claim.

The developments on this property are a tunnel, crosscutting the Union No. 1 ledge, and a shaft about 60 feet deep. This work shows a strong ledge ranging in width from 6 to 10 feet. In a cut on this ledge an ore body is exposed 9½ feet wide. Samples assayed give results from $10 to $400 a ton. Alongside and south of the wagon road where it crosses the No. 1 ledge is the south cut, where the Crystal Lake Co. is sinking and drifting. The ledge is over 20 feet wide and has a sharper dip to the southwest than at other points. Ores from this property have heen milled in quantity with results as follows:

5	tons amalgamation only	$ 9 25	per ton.
8	" " "	11 00	"
600	" " "	7 00	"
300	" " "	7 34	"
10	" " "	12 38	"
53	" " and sulphurets.	23 24	"
410	" canvas tables	7 00	"
3	" cyanide (90% recovery)	8 10	"

The Baltimore group, ahout 1½ mile southwest from Meadow Lake, has copper present in the ores to a noticeable degree. On the New Find claim is a ledge ahout 5 feet wide, assaying 9% copper and $1.65 gold. The Alta shows a strong ledge, averaging 4 to 6 feet wide, assaying $1.60 to $2.50 per ton in gold and 6% to 14% copper. The ledge matter is strongly magnetic, deflecting the needle. The Selby claim shows a very strong vein, with a shaft over 70 feet deep. The ore carries $2.06 to $8.06 gold per ton and 1.5% to 2% copper; antimony is also present.

On the Quebec the ledge is 6 to 8 feet wide and assays $4 to $23 gold and as high as 30% copper. A shaft is down 92 feet, and at the bottom the ledge, as far as crosscut, shows a width of 9 feet. The copper ores consist of hornite and other sulphides, with some malachite.

About a mile south lies Old Man mountain, its crest standing at an elevation of 7811 feet above sea level. Crossing this mountain is an important system of ledges, carrying high values in gold and high-grade concentrates.

The Omaha mine (formerly known as the Mohawk & Montreal) was worked in early days. The ledge is from 4 to 6 feet wide and dips southwest ahout 85°. On the shore of the lake stand the ruins of the old 10-stamp mill, and it is stated that one shipment of hullion from the mill was valued at $75,000. It is evident that no concentrates were saved. The tailings now on the old Omaha mill dump contain about 20% concentrates worth over $50 per ton. The Omaha has heen opened hy several tunnels. The ledge was stoped from the middle tunnel to the surface, thus leaving an open cut ahout 200 feet deep and 100 feet long. In this cut or open stope a considerable hody of ore remains, and, where over 4 feet wide, assays $41.55 gold; concentrates 11.5%, value $144.90 gold per ton.

Parallel with the Omaha ledge and within the side lines of the claim lies the Little Philadelphia, a claim 50 feet wide. This ledge seems to be a spur from the main Philadelphia ledge. On top of the mountain on an ore shoot is a shaft about 20 feet deep. The ledge is fully 6 feet wide. The ore shoot pitches southeast on the strike of the vein. The gangue of this vein is a sugary quartz, with a porosity due to oxidized sulphurets. This porous ore assays as high as $154 a ton, and one lot of 2100 pounds assayed $41.34. This latter was milled and yielded on the plate 72% of the assay value. Concentrates 11%, value $28 93.

On the Philadelphia ledge are located four claims, embracing 6000 feet. On the Philadelphia and Yuba claims the ledge is most strongly marked, and the grade of ore higher thau farther down the easterly slope of Old Man mountain. This ledge will average 4 to 6 feet wide and has a slight dip to southwest. On the Yuba claim is a tunnel about 20 feet long. Samples taken across 3 feet of pay assayed $12.40 gold, concentrates 4.25%, value $181.91 gold. Other samples from this place assayed as high as $68 gold per ton.

On top of Old Man mountain, about 600 feet southwest from and parallel with the Philadelphia ledge, is a claim called the Gold Cliff. A sample taken from this ledge assayed $11 gold. The southerly slope of Old Man mountain rises rapidly from the foot, about a quarter of a mile north of Fordyce creek, at an angle of about 50°, to the top. The elevation at the creek is about 5700 feet and the top 7800 feet, a rise of over 2000 feet. On this slope is another system of ledges known as the Carlyle, or Old Man mountain group. These extend in a southeasterly direction, crossing the creek and over the ridge into the Enterprise district—over 1 mile distant. The veins have the same general characteristics which prevail in the Philadelphia ledge. The ledges are well mineralized, averaging 5 to 8 feet in width, and yield values from $10 to as high as $100 gold per ton. The ores are easily milled and the concentrates are amenable to chlorinating or cyaniding. The concentrates carry $40 to $70 gold, and from 15% to 25% of the ore. On the Pennsylvania 10% copper ore is found.

Northwest of Old Man mountain is the Hecla, on which is a shaft over 50 feet deep. The ledge is strong, carries gold-copper as high as 15%, and assays have shown silver as high as thirty ounces per ton.

The Enterprise system is ahout 1 mile southeast of the Carlyle group. In 1866, it is stated, that in the Enterprise mine specimens of great richness showed on the surface. Twenty-four hundred pounds of specimen rock were sold and yielded to the huyers a profit of $4000.

About 2 miles southwest of Old Man mountain and 2½ miles north of Cisco is Red mountain, the highest point of which, Signal Peak, is 7860 feet ahove sea level. Crossing this mountain is a system of ledges, the ores of which differ in many characteristics from the ores in the Meadow Lake or Excelsior systems, and perhaps more nearly resemhle the Old Man mountain ores. The formation is similar to the Sailor canyon formation of the U. S. Geological Survey. The slates are strongly metamorphosed, especially near the contact with the granodiorite. Numerous dikes of phorphyritic rock and small limestone bands traverse the mountain. Calcite is of frequent occurrence in the ores found on the Gen. Otis claim.

The ores of the Otis ledge are heavily mineralized, and contain gold, silver, copper, cobalt (cobaltite), and traces of nickel, and may he classed as high grade. The Gen. Otis claim is situated just north of Signal Peak. On the west slope, south of and parallel with the Otis, is a strong ledge, ahout 300 feet distant, on which is located the Crystal Spring mine. On this a shaft has been sunk 40 feet, showing a ledge 4 to 6 feet wide. The Otis ledge has been developed in two places, an open cut about 300 feet from the top of the ridge down to the slope, or 250 feet vertically, where the ledge is 12 to 15 feet wide, the "pay" ahout 6 feet wide. The ledge is exposed about 6 feet deep, is heavily mineralized, containing over 20% of sulphurets, and assaying $30 gold, copper 4%.

A 1000-pound lot of this ore hy stamp milling yielded at the rate per ton in gold, $23.51, silver 24 cents; or 68% of the assay, which was, gold $33.07, silver $1.68 and copper 3%. The concentrates amounted to 33.6%, which assayed, gold $24.80, silver $1.92, and copper 6.5% per ton. Reduced to the original ore the gold would he $8.34, silver 64 cents and copper 2.15%. The loss in the final tails was, gold $1.24, silver 80 cents and copper $\frac{85}{100}$ of 1% per ton. The recovery can then he estimated as, gold 96.3%, silver 52.5%, copper 70%.

A chlorination test on the same lot of ore yielded, gold $30.79, silver $1.08, total $31.87 per ton, or 91% of the original value of the ore. Another lot of the ore was given a chloridizing roast with salt and 87% (fifty-four pounds per ton) of the copper contents extracted by leaching with water. The loss in roasting was about 3%.

Lots of several tons of this ore have heen given an oxidizing treatment in the roasting furnace, and after treatment it was found that 87% of the original value in gold could he saved hy amalgamation.

In conclusion it would seem that the Meadow Lake district offers considerable inducement for investigation and investment. The roads are built, comparatively little expense to he incurred in putting such of the roads as need it in good condition. While the snowfall is heavy in some winters, yet there is no climatic condition to prevent continuous operations in mining and milling. The district is within easy reach of the railroad; there is an abundance of timber for fuel and building purposes; water is abundant and cheap and can be delivered under excellent heads. Labor is no higher than at Nevada City or Grass Valley, and finally, pay ore is present in large quantity, and the extraction of the gold is practicable by ordinary, well known, simple and inexpensive methods.

Ankylostomiasis.

There is a disease which attacks laborers in tunnels and mines. It is as old as Egyt, but only recently has it been traced to a specific parasite. It is a painful and dangerous disease, resulting sometimes in death. A monograph on the subject of this malady, called ankylostomiasis, has been prepared hy H. F. Goldman, official physician in the coal mines of Brennberg, near Oldenburg, Germany. It attacks not only men, but animals, especially the horses and mules used in the building of tunnels and the operation of mines. It is caught by infection, like typhoid or cholera. It may he contracted in the air or by contact with the germs, which are really the eggs of the little worms, or ankylostoma, as it is called. This name means "hooked mouth," and refers to the six hooked teeth around the mouth of the

parasite, by which it clings to the interior of the human intestine. It is found, not only in the duodenum, but also in the smaller intestines, where it grows and flourishes. Male and female can be distinguished among the parasites, the females being larger and more numerous than the males. The males grow to the length of .3937 inch, and the female is on the average half as long again. They can be seen with the naked eye. This animal has neither breathing apparatus nor circulatory system, and varies in color from grayish white to brown, and even blood red, according to the conditions of the person in whom it is found. The female lays a large number of eggs in the human intestines, from which they spread the disease infinitely under proper conditions. The parasite and the egg develop best in a temperature between 65° and 85° F. It is on account of the moisture and heat to be found in mines and tunnels that this parasite develops. Darkness is also necessary, sunlight killing these animalculæ almost instantly.

Gold Placers of Nome, Alaska.*

An examination of the geological map of the Seward Peninsula, Alaska, will show that the important placers have a certain zonal arrangement, and, broadly speaking, group themselves into belts which have a northeasterly-southwesterly extension. The southern belt includes the auriferous deposits of Cripple river, the Nome region, the Kruzamepa valley and the drainage basins of Solomon and Niukluk rivers. The northern belt embraces the placers of the Bluestone, the Agiapuk and the Kugruk. These two zones are separated by the Kigluaik mountains and the Bendelehen group. The relation of the York region to the others has not been determined. These, with those reported from the Arctic coast, may form a third belt. Broadly speaking, the mountains owe their origin to the uplifts and to the intrusion of larger masses of granitic rock along their axes. One result of this structure is a duplication of the same metamorphic series on both sides of the range. As the placer gold is derived from these metamorphic series, its distribution will be effected by their occurrence, and there result two zones of placers corresponding with the two belts of gold-bearing bedrock. While these two areas lying on either side of the anticlinal uplift, which is the dominant structural feature in the region, can be claimed as auriferous, the writer does not wish to imply that the entire area of these two belts will carry workable deposits of gold. On the contrary, the facts indicate that the gold belts are not continuous.

Local Distribution of Placers.—The detailed descriptions which have been given lead to the conclusion that within these two zones only certain creeks seem to carry placer-gold values; some others carry colors of gold, while from many gold is, as far as known, entirely absent. These facts are so well known in the region by every intelligent prospector that they do not need to be here exemplified. The question arises: What is the reason for this irregular distribution of the placer gold? In answer, we must consider, first, the source of the gold, meaning thereby its immediate source in the bedrock, and, second, the manner in which the gold has reached its present position in the placer.

Local Origin of Gold.—In the discussion of the source of the gold the most serious difficulty is that the bedrock geology is not yet known in sufficient detail to afford a good foundation of fact. In a previous publication Mr. Schrader and the writer made the statement that the Anvil creek gold was of local origin. The studies of the last season would confirm this view and would extend it to include practically all the placers of the region. We are led to this conclusion by the character of the drainage basins, of the gold itself, and of the gravels with which it is associated. In nearly every instance the source of the gravel of any given auriferous deposit can be assigned to a local cause. Local origin, being only a relative term, does not admit of any exact definition. In most of the gulch placers the gold is believed to have its source in the drainage basin of the streams in which it is found. In the case of deposits that belong to an older drainage system, the same is true of the gold of their drainage basins. In the gravel plain and beach placers, local origin for the gold implies that the source is in drainage basins of the streams of the immediate vicinity, and that it has reached its present position by water transportation. Many theories are popular among the miners, which involve a glacial, volcanic and even meteoric origin for the gold. The facts to be presented will show that no such agencies have played any part in the formation of the placers.

Occurrence of Gold in Bedrock.—In many instances gold is found attached to fragments of vein quartz or of schist, showing conclusively that it is of vein origin or from impregnated zones. Assays have shown that traces of gold and silver are quite common in the veins and mineralized schists of the shear zones. In a few cases veins were assayed which carried commercial values, but they are relatively rare.

Derivation of Placer Gold.—These facts point to the conclusion that the placer gold of Seward Peninsula has its source in veins and impregnated beds which occurred close to the present location of the placers. The mechanical destruction of the bedrock and its included veins and mineralized zones has set the gold free, and it has been subsequently concentrated in the gravel deposits where it is now found.

It has been noted that in some localities there is evidence of an older drainage system and that the source of the gold is not, necessarily, to be sought within the drainage basin in which it is now found. The main point which seems to be established is that the gold has not been brought far and that its source is within bedrock identical in character with that which is now exposed.

Concentration of Gold in Placers.—The question is often asked: If the gold be of local origin, why is it that there are such rich placers in a region where the quartz veins seldom carry values, and, in fact, are often entirely barren of gold? This is a practical question and one which it is not always easy to answer. To tell the average miner and prospector that the gold has been concentrated out of a very large amount of bedrock, is but to state to him a fact of which he is already well aware. At the same time, one who is not accustomed to measure time in terms of geology can not, as a rule, easily conceive what geological time signifies. The average man knows by his own observations that rivers and streams erode their channels, and that the topography is more or less the result of erosion; but, unless he has made a study of the matter, he will hardly realize that nearly all topographic forms are due to destructive rather than constructive agencies, and that any given river system has been gradually developed by the erosive forces. Thus, in the region under discussion, the rivers and streams have incised their present valleys into what was, presumably, at one time, a nearly level surface. The thickness of material removed is to be measured in hundreds of feet, and, in some cases, in thousands. The amount of material removed, measured horizontally, varies, of course, with the size of the drainage basin. It is easy to see that in the carving out of a drainage system, such as that of Anvil creek, for instance, a very large amount of material has been removed, carried out and redeposited outside of the basin itself. The gold contained in this mass of bedrock, which has been gradually carried away by stream and frost action, remains, since it is, comparatively speaking, indestructible; while the parent rock in which it was contained has been ground up, dissolved and washed away. This gold is sorted by the water, accumulates and forms placers.

The chief reason why more veins are not found in the region is because much of the gold was widely disseminated in small quartz stringers and in impregnated zones of the bedrock. It was not derived from a mother lode, but in the course of the destruction of the bedrock the gold thus widely disseminated in small veins was concentrated in the sands and gravels. This does not by any means preclude the possibility of the presence of workable quartz veins in the region. In fact, some veins and impregnated zones carrying values have already been discovered. Compared with the amount of material which has been removed and destroyed, the amount of bedrock now exposed and accessible to the miner and prospector bears a relation of something like a thousand to one, if not a million to one. We have access to bedrock only along the stream channels and along valley walls. It is easy to see that the surface exposed, especially considering the thick coating of moss, which nearly everywhere hides the underlying rock, is but a small fraction of the amount which must have been removed during the formation of a stream valley.

* Alfred H. Brooks, in Reconnaissances in the Cape Nome Region in 1900, U. S. Geological Survey.

A New Method of Prospecting for Gold and Silver at a Great Depth.

To the Editor:—The Comstock, Virginia, Nevada, has had many ups and downs. People connected with the lode once thought that the ore bodies had given out and just about that time always something new turned up to resurrect the old lode. Con. Cal. & Va., which was supposed to have seen its best days in 1879, came to the front again as an ore producer in 1886, and between 1886 and 1890 the mine produced about $14,000,000. Once more after that a small deposit of ore was found in the upper levels. About two years ago a movement was made and successfully carried out to unwater the Lode, and which so far has proven a great success, inasmuch as it enabled C. C. & Va. to become an ore producer again. Several years ago the Comstock mining companies purchased ground about one-half mile to the eastward, and which is now known as the Brunswick Lode. Two shafts were started, one on the ground belonging to the Best & Belcher and C. C. & Va., and one belonging to the Chollar, Potosi and Norcross. After going to a depth of 200 feet they encountered a body of ore in the Chollar which produced over $200,000. They continued sinking a shaft to a depth of 1000 feet, opened several levels, and, although the ledge retained its regular dip and size, the quartz encountered carried but little value.

These quartz bodies in the Chollar were evidently making to the south and when the drift from the Chollar ground was in about 300 feet in Potosi ground it encountered a body of quartz about 40 feet wide of low-grade ore. Circumstances over which the mining companies had no control prevented them from exploiting this body of quartz, and it is this that they are trying to prove with a new drill called the Davis Calyx Drill.

Seven Comstock companies owning ground on this East Lode, or what is called the Brunswick Lode, jointly bought one of these drills and concluded to make the first attempt to test the efficiency of the drill on the Potosi ground. The idea is to cut the downward continuation of the quartz body found on the 600-foot level at a depth of 850 feet. The inventor of the drill, F. H. Davis, considered the work of such great importance that he has come especially from New York to superintend the setting up of the drill and will likely remain until the hole is completed. The drill is expected to make from 20 to 40 feet in twenty-four hours.

People familiar with the Comstock know of the existence of ore bodies in some of the mines on the Comstock in the lower levels, now being under water. The expense of unwatering the whole lode is so large that it requires an actual demonstration of the existence of ore in these lower levels to induce the shareholders to pay assessments toward raising money to unwater these mines. It is expected that this drill will demonstrate at small comparative expense whether an ore body exists in the lower levels or not. Everybody connected with the Comstock is watching with a great deal of interest the workings of this new drill. Comstock.

Virginia, Nev., Jan. 18.

The Godbe Agitation Method of Leaching.

This is a new method, recently patented, of leaching fine or slimy ores by agitation and the separation of the solution from the ore.

It is a well known fact that the finer an ore is pulverized the higher is the extraction by the cyanide solution; but it is also well known that very fine or talcy ore can not be successfully leached by the ordinary method of percolation, owing to the material becoming so packed down that it will not permit the solution to pass through it. A much more thorough and perfect dissolving of the metals is obtained by stirring or agitating the pulp in the solution; but the difficulty has been to economically and completely extract or separate the gold-bearing solution from the fine ore or slime after solution was completed. This is the difficulty that the Godbe process overcomes.

The process consists of a combination of agitation and upward percolation, simultaneously, in the same vat. The pulp is stirred with a cyanide solution, containing lime, in a circular vat, the diameter of which is not greater than the depth, and, while being so stirred, a stream of solution is introduced from below through a false filter bottom and rises up through the agitated and suspended ore, and overflows at the top perfectly clear and free from slime. To do this the miller or stirrer is placed close to the bottom of the vat and does not revolve fast enough to throw the slime up to the surface of the charge, but just sufficient to keep the entire mass in suspension and flowing around in the tank, and, at the same time, always leave a few inches depth of perfectly clear solution at the top. The solution in its upward course makes an intimate contact with every particle of slime, as the latter is constantly changing its position in the tank and rises above the mass as clear solution at the top. The overflow of solution is ready for precipitation.

During the period of dissolving the gold the speed of the stirrer is increased so that the entire charge is in thorough agitation, and at this stage compressed air can be blown in to hasten the dissolution of the gold if the ore requires it. After the solution of the metal has been effected, the gold-bearing solution is washed out of the slimes by displacement with weak solution, until all the gold-bearing solution has been washed out of the charge, and in turn the weak cyanide solution is displaced with water. Finally a plug is drawn and the tailings allowed to run out through the bottom. Each displacement operation washes out about 80% of the solution contained, so that it generally takes three displacements—two of solution and one of water—to recover practically all the gold-bearing solution from the charge. These displacements, however, take place very rapidly, from four to six hours only being required for each one. The amount of solution to ore varies according to the specific gravity of the slime, being from 1.2 to as high as 3 parts of solution to 1 of ore. When used in connection with plate amalgamation, no settling is required, as the water is withdrawn by displacement with the cyanide solution. One important feature is that by using a large quantity of solution, which can be done, the upward percolation taking place so rapidly, a very much weaker solution can be used and still bring the proper or necessary amount of cyanide of potassium in contact with the metals to be dissolved, thereby reducing the loss of cyanide to a minimum, both as to the loss of the latter in attacking base metals and to the ordinary losses of solution. A warm solution greatly assists the operation, mechanically and chemically.

Mine and Mill Work at Hedges, Cal.*

[STAFF CORRESPONDENCE.]

The gold mine at Hedges, San Diego county, Cal., is in a spur of the San Bernardino range, 5 milles north of Ogilby station on the Southern Pacific road. The mine is a bedded ore hody that dips 33° east, with a north and south strike. The country rock is a schist. The vein walls are not well defined, the vein matter appearing to merge into the general formation. The ores carry some free gold that pans and amalgamates, also a considerable amount of a flour fineness that requires cyaniding to recover. These values are in a matrix of dark and white quartz, schist and granitic rock with more or less magnetic iron through it all. They carry a small amount of silver and copper and are stained with epidote in places.

The main property, called the Golden Cross, is opened by an incline that coincides with the general pitch of the formation, and which sinks to a depth of 1100 feet. From each 100-foot station a drift runs northward into the ore body, which adjacent to the shaft is pretty well stoped out from the 900-foot station to the surface, the stopes heing timbered with square sets from level to level. At each level is a dumping hin over the incline which discharges into the skip.

As new work is opened a winze is made in ore from one level to another, which estahlishes good air circulation. Present new work is between the ninth and tenth levels and on the eleventh. The production from the stopes ahove the tenth shows as rich ore as at any level ahove it. The ores at this depth comprise more of a white quartz than those from higher levels. At the 200 level there are a numher of chutes that convey the ore from the deep excavations at the surface. These chutes load into cars which carry the ore to the incline skips. From the 200 level a crosscut is being run several hundred feet southeastward to open another ore body which has some surface work. John Malone is mine superintendent.

The incline skip dumps the ore into hins, which load into tramcars, the latter carrying it to Gates crusher, located hetween the shaft and mill. A hoisting tramline conveys the ore from crusher to the mill hins, which feed automatically into hatteries of the 100-stamp mill. This is huilt in two sections—fifty stamps on each side, with the ore hins above and hetween them. The stamps are 1000 pounds weight, drop ninety-six, and crush four and one-half tons of ore per twenty-four hours. The screens are the No. 10 diagonal, slot-punched, equivalent to ahout 40-mesh. Below each hattery is a copper amalgam plate, 28 feet long, with a fall of 1½ inches to the foot. Mill superintendent R. R. Wheeler states that 70% of the total saving is made on the plates.

At the mill are four 100 H. P. hoilers, wood heing used as fuel. These drive a 300 H. P. mill engine. Besides the mill machinery and dynamo for light, this engine drives a 10-drill air compressor.

The mill has heen operated for over five years, and the impounded tailings from it now cover several acres, from 20 to 30 feet deep. A cyanide plant estahlished later is now operating on the accumulations of the first two or three years. This plant consists of five steel leaching vats, 300 tons capacity each, with four hottom-discharge doors, hy which the pulp is sluiced out to the wash helow; two 180-ton standardizing tanks, precipitating room, and two 180-ton sump tanks. It requires seven to eight hours to fill each tank, in which a three-pound solution is used for first treatment. The consumption of cyanide amounts to six-tenths to seven-tenths of a pound per ton of pulp. The presence of ahout $\frac{7}{10}$ of 1% of copper increases the requirement of cyanide. The zinc consumption amounts to one-tenth of a pound per ton of pulp. To neutralize the acids in the pulp ahout two pounds of slacked lime are added before leaching. H. W. Durrell, in charge of the cyanide plant, says: "In the cleanup the precipitates are carried hy launders to two vacuum filters and from here are carried to a two-ton lead-lined acid tank. After sulphuric acid treatment the precipitates are dried and given a thorough oxidizing roast. They are then given a treatment with dilute sulphuric (to remove copper), washed and dried. The resulting precipitates are easily fluxed and give a hullion from 920 to 940 fine."

In impounding the tailings an effort is made to keep separate the slimes from the more siliceous matter. The former heing of a clay-like consistency are a hindrance to percolation in the cyanide work.

This property, formerly known as the Golden Cross mine, now belongs to the Free Gold M. Co., of which Chas. W. Pauly is manager. Mr. Pauly states that the cost of mining and milling is within $1.25 per ton of ore; and that the cyanide work costs not over 50 cents per ton of pulp handled.

The water supply for the camp is pumped from a well at the Colorado river, 12 miles away, ahout 250,000 gallons per twenty-four hours heing delivered to a reservoir near the mill. At the pump station is a 60 H. P. Corliss engine, geared to a power pump. In this direction the water is raised 630 feet and conveyed through a 6-inch pipe.

Hedges, Cal., Jan. 2., 1902.

* See illustration on f.ont page.

Electric Locomotives.

Some interesting types of electric locomotives are herewith illustrated. The locomotive shown in Fig. 1 is intended for traction service in factories ahout mines where heavy material is to he moved on narrow-gauge cars. It is adaptahle for curves with a radius as small as 12 feet. The engine is carried on two swiveling eight-wheel trucks, with every wheel a driver, which enahles it to ascend steep grades. With a machine adapted to such short curves and steep grades almost any part of a factory may he reached.

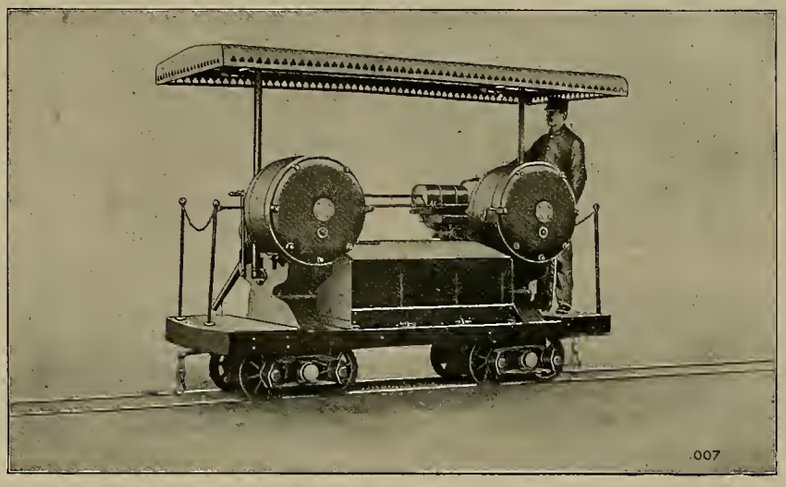


Fig. 1.—Electric Locomotive.

The locomotive makes a most economical use of power. When not at work no power is used. If it is at work just the power needed to do the work is taken. In service one man handles the locomotive, and usually does the coupling.

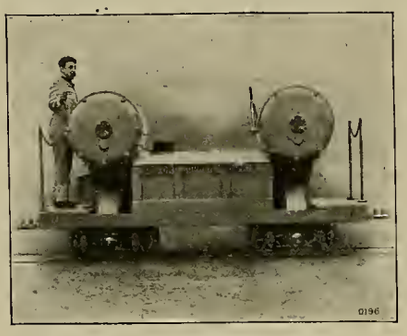


Fig. 2.—Electric Locomotive Without Cover.

The motive power for operation is furnished hy a storage battery, which is recharged at night, or during the day when the locomotive is idle. The daily recharging of the batteries, the manufacturers claim, requires ahout one-quarter as much time as the locomotive is in active work during the day.

The storage hattery on the locomotive is divided into sections, which are connected through the controller with the motor armatures and fields in various combinations of series-parallel connections, thus obtaining the different variations of draw-har pull and speed required for general shop work. Usually large and heavy hattery plates are used, which are not overworked even in starting the load, thus ensuring durahility and efficiency of the lead plates.

There are no rheostats or resistances of any kind, thus avoiding waste of electric energy either in starting or in running. The motors are proportioned to the normal output of the batteries, and to the weight of the locomotive so as to avoid overloading by the motorman.

Two independent electric motors are used, either in series or multiple, which at low speeds are said to give a large starting effort with a minimum consumption of electric current. It is evident that any increase in the efficiency of either the motors or the mechanism is equivalent to increasing the life of the batteries and the radius of action of the locomotive. These motors are said to possess the valuahle quality of pulling the hardest when the load is heing started and the speed is the slowest, and lessening the pull and increasing their speed as the car is accelerated.

In Fig. 2 and in Fig. 3 are shown the same locomotive without the canopy top.

The following figures show the structural and operative features: The approximate weight of the locomotive in running order is 5 tons; gauge of track outside of rail heads (Hunt standard), 21½ inches; Length of locomotive, over all, 13 feet; width of locomotive, over all, 52 inches; height of locomotive, over all, without canopy, 66 inches; height of locomotive, over all, with canopy, 100 inches; height of draw-har above the rail head, 13½ inches; speed per hour, variahle from 1 to 4 miles; range, in the usual run of shop and yard work, 10 hours.

The manufacturers also manufacture a type of electric switching locomotive for use on standard gauge track. The power for these locomotives is also furnished from storage hatteries and they are manufactured with different capacities for the purpose of meeting the variety of service required in yard work. They are huilt in accordance with the Master Car Builders' standards, and two motors used for driving them are so arranged as to make every wheel a driving wheel. By using storage batteries they are made much heavier than they would be if trolleys were used, but in this case the weight is considered an advantage, as it enahles them to pull much heavier loads.

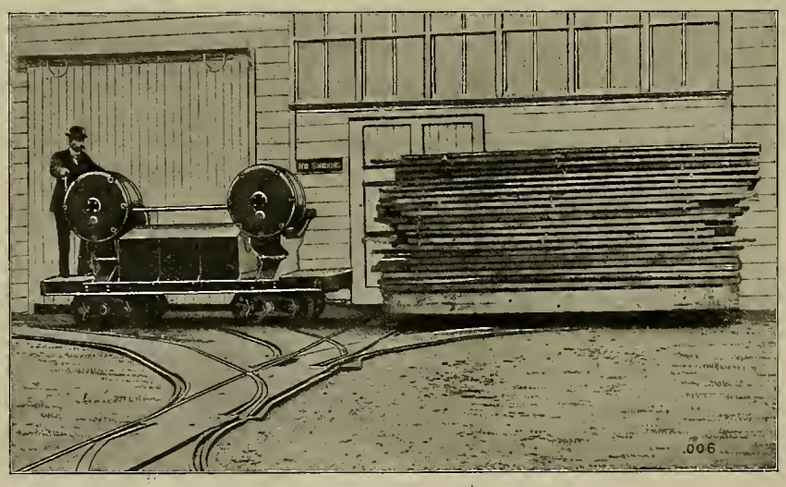


Fig. 3.—Standard Storage Battery Electric Locomotive in Service.

Telephone Troubles and How to Find Them.*

By P. Kerr Higgins, A. M. I. E. E.

Telephone trouble men are, as a rule, like poets and artists, born, not made, but the average man can, with patience and earnest effort, become quite expert at the work. A good telephone trouble man will understand not only troubles in instruments, but also in lines, cables, switchboards, etc. In short, his duties make him efficient in the whole trouble department. A line is usually drawn between the construction and the maintenance departments; this article will deal exclusively with the latter.

The first duty of the inspector, or "trouble man," is to become thoroughly acquainted with the circuit or circuits in which troubles may be expected to exist. Diagnosis is one of the first things he has to learn; he must get all the facts he can, put them together and then reason out what can and what can not cause the trouble, and this he must do before he touches the apparatus under his care. It is to be regretted that the majority of trouble men, instead of using reason and the thinking power God has given them, go after trouble in a blind manner, trusting to "luck" to find it, many of them doing more damage in one hour than can be set right in a week; and what is worse still, their carelessness is seldom found out until they have ruined the apparatus entrusted to them. Let me emphasize, then, the necessity of knowing what you are looking for and where the trouble is likely to occur before you begin dissecting the apparatus.

A telephone plant is divided into four great parts: (1) Instruments, (2) wires, (3) cables, (4) switchboards and their accessories, and the treatment and methods for location of trouble in them are very nearly the same, at least so far as the principle is concerned.

No man can properly clear trouble without tools. It can be done in a slipshod way, but not so as to give satisfaction. Show me a man's kit of tools, and by the selection and their condition I will tell you what kind of workman he is. His tools will depend on the class of work he is called upon to perform; usually the trouble man is an all-round man, and has a lineman's outfit as well as his instrument outfit. Seldom, however, if ever, are men called upon to attend to all four sections, so we will divide the trouble into two main sections: (1) Line and instruments; (2) cables and switch-room apparatus. The following list of tools will be found very handy and, although not complete for all work, it may be added to only as found necessary: One pair, 5 inches long, nosed pliers; one small hammer; three screwdrivers, 6 inches long, different size blades; one keyhole saw; one set of drills; one pair of tweezers; three small files; one pair diagonal cutting pliers; one box for fuses; one box for screws, tacks, etc.; one ratchet brace; one set bits—$\frac{1}{4}$, $\frac{5}{8}$, $\frac{3}{4}$; one small oil can; emery paper, crocus cloth; black tape (Manson); one small detector.

Instrument Troubles. — An instrument is composed of four parts: (1) The calling apparatus, (2) the receiver, (3) the transmitter, (4) the battery.

Calling Apparatus.—Calling apparatus is divided into two systems: (1) Battery, (2) magneto. In the battery system the call is usually made by depressing a button which sends the current out to the line in one of two ways (see Fig. 1). Either from a

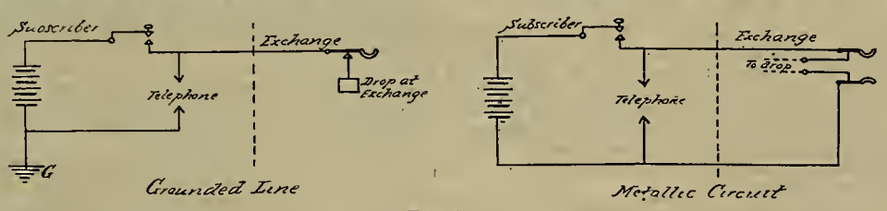


Fig. 1.

ground to a ground (a) or in the form of a metallic circuit (b), the circuit is simple and may easily be traced.

Trouble on such may be (1) weak or insufficient battery power, (2) wire broken, short-circuited or grounded, (3) a defect in the button or in the indicator at exchange end. A wire is short-circuited when the circuit is closed before reaching its destination and the term is only applied to a metallic circuit (wholly of metal, with no connection to the ground). To locate the trouble, disconnect the outgoing wire at the point where it leaves the building and apply a small detector (a battery buzzer or bell will do), to the ends of the inside wire; then depress the button, and if everything is right inside the bell will ring.

We will assume the trouble is inside, and the bell does not ring. Now take your detector to battery and see if it will ring there; if not, test out each cell separately until you find the defective one and renew it, or fix the broken pole or connection, as the case may be; if on testing you find the battery "O. K.," then tap your detector on your wires at different points until the trouble is found; before doing this, however, make a thorough examination of your wires and you will probably find the break. Sometimes the wire breaks inside the covering and can only be found by testing.

In testing for the trouble, first divide the circuit in halves and then in quarters, and so on, being careful always to start the test beyond the trouble. If on testing, the trouble is found in the indicator, then apply steady battery to the same by fastening down the button, and adjust the indicator until it responds; repair the break, if one is found. When the circuit is grounded, trouble is often caused by water or moisture on the wire; if the wire is exposed, it may also be due to a broken insulator allowing the current to pass to ground before reaching the exchange. Trouble in vibrating bells is either due to bad adjustment or broken or crossed wires.

Magnetos.—Two methods of testing the generator are used: (1) The fingers may be placed on the terminals, the crank turned, and, if the generator is in working order, a shock will be felt. I prefer this method of testing, as, if the magneto is bridged, the ringer might be open and the generator O. K. Another method is to place a piece of metal across the terminals, and turn the crank; if the bell rings it is O. K., if not, trouble is inside, but, as stated before, in the case of a bridging bell, this is not specific, and the former test should be made first, then the latter. The latter test then, we will assume, has been made, and the bells ring clear and strong, but when tried on another instrument or indicator will not work; the fingers were placed over the terminals, and the current seemed strong, then wires were taken off the terminals and it tested clear (bells not ringing). We take it apart and examine it closely, and find that trouble is due to the cutout not working properly on the armature. Now suppose, after our tests we receive no shock, the fault will be due to a short circuit (crossed wires), or to a broken wire; if, however, we received a shock, but the bell did not respond, then the fault is in the ringer and may be due to bad adjustment, broken or crossed wires; if the shock is weak, it may be due to defective or weak magnets. All contacts in magnetos should be made and kept tight, and the springs should be examined often, as holes are frequently worn in them and cause trouble. Very little oil should be used, as it is liable to cause trouble. Magneto troubles are usually easy to locate by making the above tests.

The Receiver.—Receiver troubles are mostly due to bad adjustment, dented or bent diaphragm, broken wire or weak magnets. The magnet should hold up eight ounces of metal. It will frequently be found that tampering with the diaphragm through the small aperture, indicated by indentations caused by a pencil, has been done. In this case the only thing to do is to change the diaphragm.

The adjustment of receiver magnets is different in each style. Some have a screw at the end, while in others it is on the inside. A good way to test the adjustment is to lay a long pencil across the earpiece at end of magnets, with the cap and diaphragm off, and adjust magnet so that it is $\frac{1}{32}$ of an inch clear of pencil. A part of the receiver is the cord attaching it to the instrument, and this frequently causes trouble by being broken or having tinsel worn, in which case the aggravating "intermittent" trouble presents itself, and must be patiently looked for and repaired; it is generally caused by the tinsel being worn and making poor contact; it can, as a rule, be found by twisting or pulling the cord while holding receiver to the ear. The interior of the receiver should be kept clear of dust, as also the front of magnets.

Transmitters.—Black style common faults are due to poor adjustment and to a hole being worn in the carbon button; this latter is remedied by rubbing the button on a piece of crocus cloth and then polishing it with a common leadpencil. Another source of trouble is bad contacts, especially at the hinges, and rusty or dented diaphragm.

Solid back or granular carbon style: The most frequent faults in these are packing of the carbon, loose contacts, bad joints or damaged diaphragms. The packing can be remedied by tapping the transmitter lightly on the side, or turning it upside down; it is best not to take it to pieces, unless thoroughly acquainted with its construction, to know which it is best to practice on a defective instrument. Loose contacts have to be cleaned and tightened, or soldered, as the case may be. Damaged diaphragms must always be changed.

Receiver Hook.—The receiver hook, or gravity switch, is the cause of many complaints, which are generally due to dirty contacts or weak springs, and can be found and remedied very easily by cleaning or retempering the springs; the latter may be done by heating the spring to a red heat and then dipping it into water; if this makes too hard a spring, it may be softened slightly by using oil, instead of water.

Battery.—Battery troubles are due to exhausted solution—as shown by the formation of crystals on zinc and carbon elements—impure or worn out zinc, corroded poles or connections.

In renewing batteries do not use more solution than is specified in directions, as it will be more injurious than helpful; always throw away the old solution. In the Fuller cell the solution, when weak, is a very dark color. It is folly to use very cheap zinc, as it generally contains arsenic, or some form of iron, and is known by the honeycombed state of the zinc or its black appearance. Porous cups are past repair when they become rusty in color. All connections should be kept clean and protected from the fumes or acids of the battery. Use soft water in making battery solutions.

Line Trouble.—Troubles on lines are of four kinds: (1) Grounded, (2) crossed, (3) open, (4) cut-out or intermittent trouble. A line is grounded, either wholly or partially, by coming in contact with the earth or any conductor connected to the earth; if the line is long, experience will enable one to know, more or less, the distance of the ground by the amount of noise or induction on it; or it may be tested, as previously stated, with the detector; if a short line, it may be gone over, having the cause in mind. In removing the fault, if due to a slack wire, do not tie the wire back with a string, as is sometimes done, but pull it up and cut out the slack.

A crossed wire is a wire crossed with another circuit. There are two kinds of crossed wires—a true and a false; both are real, but the first is on the line, the other is due to two or more subscribers being connected to a ground, or return, which is or has become defective, and, instead of carrying the current to ground, the resistance being too high, it goes over to the other line or lines. A cross on the line may be found and cleared in the same way as a grounded wire. An open line may be due to a break and will be easily found by going over the route of the line; but, if caused by an open joint, it is not so easily found. To locate this, and many other faults, a trouble man should have a portable instrument, or test set, consisting of a generator and a band telephone, or receiver, which is also used as a transmitter. With this he can go out on the line at any point, connect his test set and call in; he can start in middle of line and test, as already described in the battery test (Fig. 2). If a cut-out or intermittent fault

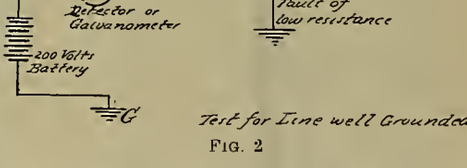


Fig. 2

presents itself, test as previously given, using one cell of battery. To avoid trouble, keep your line routes clear of broken insulators, etc., and avoid having slack wires. Noisy lines, due to cross-talk or induction, may be made quiet by judicious transposing, the number of transpositions necessary being determined by the length of line under treatment, and its proximity to disturbing wires. By transposing, is meant changing the exposed wire at regular intervals from a few inches, as in cables, to every quarter of a mile, as on long lines. (See Fig. 3.)

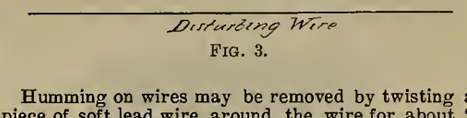


Fig. 3.

Humming on wires may be removed by twisting a piece of soft lead wire around the wire for about 2 feet, near the house or pole, or by placing a piece of flat wood on top and bottom of wire and tying them together.

The Sparse Distribution of Tin.

Tin is the most sparingly distributed metal in common use. In this respect it compares interestingly with gold, the known workable deposits of which cover 1,500,000 square miles, while the workable tin deposits are confined to less than 125,000 square miles; from which it appears that for every square mile of tin ground there are 132 square miles of gold-yielding territory. Furthermore, while there is scarcely a country in the world in which gold might not be profitably obtained, or from which it has not been obtained in the past, there are at the present

*Condensed from The American Telephone Journal.

time probably not more than a dozen districts in the world from which tin is obtained. The tin deposits of Cornwall, famed in history as the source from which the Phœnicians obtained their tin supplies, and which have yielded immense quantities continuously down to the present, are now practically exhausted, and the same may be said of the condition of the ore deposits of Bohemia, Tuscany, southern Spain and the Pyrenees.

In all the vast area of Asia, but two districts are known in which workable deposits of tin exist; namely the Hunan district of China, and the Straits Settlement and adjacent principalities, from the latter of which hy far the largest quantity of the metal has heen ohtained for many years.

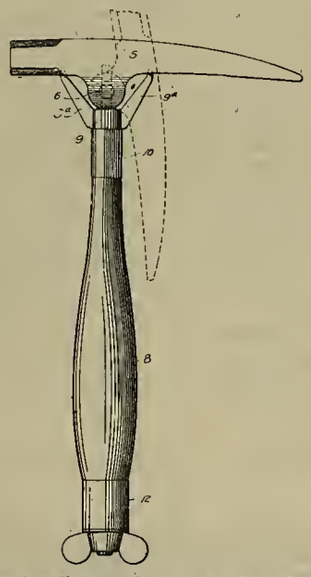
Thus far no workable tin deposit has heen discovered in Africa. In North America at present there is not a single tin mine in operation, though promising deposits have been located in at least four widely separated localities, viz.: Virginia, Dakota, California and Alaska. In Mexico extensive deposits of tin are known to exist in the province of Durango; when facilities for transportation are provided they will douhtless add greatly to the world's supply. At present, however, they remain untouched. Brazil, Bolivia and Peru in South America have paying tin ground, but the yield thus far is comparatively small, and is confined to the last-named two States. Lastly, Australasia is the source of a considerahle supply of tin from lately discovered deposits in Australia and New Zealand. At present the product is only ahout one-tenth that of the Straits, but it is steadily increasing.

Mining and Metallurgical Patents.

Patents Issued January 14, 1902.

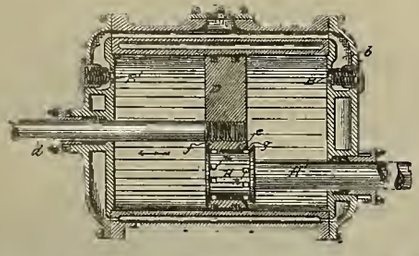
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

PROSPECTOR'S PICK OR SIMILAR TOOL.—No. 691,309; F. S. Goldsmith, Denver, Colo.



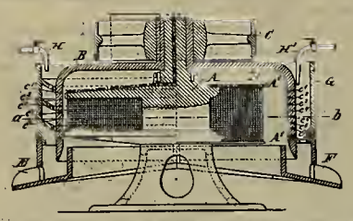
A hollow handle, a rod passing therethrough and protruding at hoth ends, one extremity heing threaded, a tool head hinged or pivoted to one end of rod, a hrace swiveled on rod adjacent head and provided with two arms whose extremities engage recesses formed in head on opposite sides of pivot and in a plane at right angles to axis of pivot, rod being formed polygonal in cross-section adjacent brace, and adjacent handle extremity having counterpart socket in which polygonal part of rod fits, and a nut applied to threaded extremity of rod remote from head for holding assembled parts in position.

PISTON VALVE FOR AIR COMPRESSORS.—No. 691,042; B. L. Brinton and W. P. Brinton, Bradford, Pa.



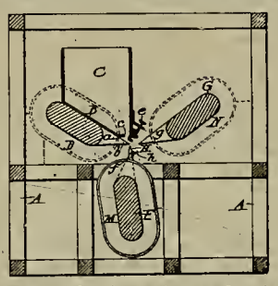
A cylinder, a piston working in cylinder, a piston rod rigidly connected to piston for operating it, a valve traveling with and moved hy piston hut having a limited movement in an opening therein wherehy position of valve is changed at each reversal of direction of travel of piston, and a hollow stem on and movahle with valve working through on opening in one end of cylinder and adapted to communicate with interior of cylinder on one side or other of piston according to position of valve relative to piston.

MAGNETIC SEPARATOR.—No. 691,262; G. Grondal, Pitkaranta, Russia.



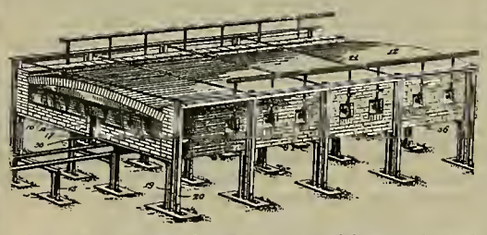
A magnet with a vertical core and circular pole pieces, hut cut away on one side, a cap of non-magnetizable material mounted to revolve around and envelop core and magnet, lamellæ of magnetizable material inserted in cap hut magnetically insulated from each other, means for feeding water with material to he separated, means for revolving cap and means for spraying water on material at weakest magnetic point of revolving cap, water feed and arrangement of lamellæ causing particles to turn during revolution of cap wherehy non-magnetic materials pinned down by the magnetic ones hecomes freed and can he carried off.

MAGNETIC SEPARATOR.—No. 691,007; F. A. M. Schiechel, Frankfort-on-the-Main, Germany.



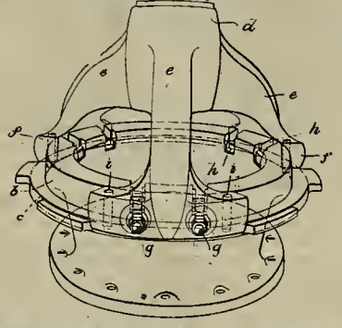
A supply magnet having a tapered pole piece and arranged in a horizontally inclined position so that material to he treated will gravitate over its edge, and a plurality of magnets whose pole pieces are of opposite polarity to that of supply magnet, one of last named magnets having its pole piece arranged helow and in vertical plane of that of supply magnet, and another of last named magnets being arranged in a horizontally inclined position with its pole piece in horizontal plane of that of supply magnet with intervening spaces between respective pole pieces.

ORE ROASTING FURNACE.—No. 691,112; J. P. Cappeau, Joplin, Mo.



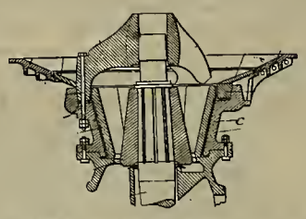
An ore roasting furnace, comprising a hearth having a longitudinally disposed slot in floor for admitting air to hearth; of a rake for stirring and advancing ore; a carrier disposed externally of hearth and connected with rake; a series of gates in slot; and adjustahle means for controlling passage of air through slot into hearth, and mounted to give way to rake operating device during its travel from end to end of furnace.

ROCK OR ORE BREAKER.—No. 691,339; A. J. Gates and T. W. Capen, Chicago, Ill.



The crushing chamher wall of a shoulder upon wall of crushing chamher, a spider comprising a heavy cast stationary hub and heavy arms integral therewith which extend independently outward to wall of crushing chamber and downward to shoulder on it and are seated within recess formed hy shoulder and crushing chamher wall, and means for attaching ends of the arms firmly to shoulder and wall of crushing chamher.

ORE CRUSHER.—No. 691,135; E. E. Hanna, Chicago, Ill.



A main frame portion provided with a recess in upper inner surface, crushing concaves in frame portion, upper ends extending ahove hase of recess to form it into a groove, and a spider portion provided with a hase portion resting in groove and secured therein.

A New Graham County, Ariz., Mine.

[STAFF CORRESPONDENCE.]

The Consolidated Gold Mountain M. Co. of Tucson, Ariz., has acquired a group of twenty claims in the Galiuro mountains, Graham county, 50 miles northwesterly from Wilcox and 30 miles west of Fort Grant. The locations cover about 6000 feet of the strike of a ledge that strikes north and south through quartzite and porphyry formations. By the outcropping this ledge is traceahle about 6 miles in length. Rattlesnake canyon cuts through the ledge at one point, leaving the ore exposed on hoth sides of the canyon, showing width and character of vein matter to a considerable depth. This erosion is taken as the starting point for development work. On one side of the canyon a crosscut has heen made, better exposing the face of ore, and a tunnel drift run on the vein. On the other side of the canyon a second tunnel drift has heen driven on the ledge. This development, as well as some surface work elsewhere, shows the ledge to he at least 250 feet hetween walls, the ore heing quartz, carrying free gold. It is stated that an average of forty samples taken across the vein at different depths showed gold values of $6.10 per ton. The canyon referred to cuts the ledge ahout 250 feet helow the general surface outcrop.

Camp of Consolidated G M. Co., Graham County, Arizona.

The property includes two millsites and two power plant sites. It is claimed the company can develop 1500 H. P., which will he utilized to provide electric power to operate mine and mill machinery. It is stated that plans are now heing made for a 200-stamp mill on the property. The company is made up C. R. Fleming, P. W. Fleming, J. B. Wright and associates.

The same company own the Narragansett mine, east of Helvetia, in Pima county. It is heing developed. Former owners shipped sorted ore from the mine which averaged 17% copper, realizing in all ahout $20,000. Present work includes a 50-foot crosscut in ore from a 60-foot shaft sunk on the vein. From the same shaft is a 100-foot drift along the course of the vein. At another point a new two-compartment shaft is heing sunk, designed to go to water level, which is estimated to be hetween 200 and 300 feet from surface. The surface ores were copper oxides and carhonates, hut with depth have hecome chalcopyrite. The intention of the company is to erect a concentrating plant for this ore.

The south extension of helt is controlled by R. Fleming and E. B. Knox, who are doing some development work, the showing heing similar to that above noted. The north extension is owned hy C. S. Fleming and others. E. S. Dodge and G. Bronson also have locations on the same helt, 4 miles south of the canyon.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

KETCHIKAN.

Stevens, Fenton & Blanchard have a skid-sled road from their mine at Khyam, on Prince of Wales Island, to the head of the east branch of Skowl Arm. The skid-road consists merely of an ordinary corduroy road in the center of which there is a rail which serves to keep the sleds on the so-called track, the incline being such that no traction power is needed, except in hauling the empty sleds back up the mountain to the mine. In the moist climate the logs of which the road is constructed, having been peeled of their bark, have a smooth, slippery surface, upon which the sleds glide as if on snow or ice. The sleds carry down one ton each. The developments at the mine at present consist of a crosscut tunnel which shows an ore body 18 feet in width, and a drift on the trend of the vein 25 feet, the latter all the way in ore which carries from 18 to 22% copper, $6 gold and $4 silver to the ton, and some nickel. They expect returns of over $50 per ton from the 100 or more tons they have ready for shipment.

The Valparaiso mine at Dolomi, Prince of Wales Island, has shipped fifty-six tons of gold quartz ore, the value of which is estimated at $12,000. A previous shipment of thirty toos from this mine gave returns of $185 per ton.

The development work on the Puyallup mine, near Hollis, on Prince of Wales Island, is being continued and some very rich ore is being trammed down to the beach for shipment. R. Allison, manager, has ordered the machinery for a 5-stamp mill, complete, to be operated by water power. It is expected to have it set up and ready for operation by May 15.

ARIZONA.

COCHISE COUNTY.

The Tombstone Con. Mines Co. is putting in an electric light plant to furnish lights at the hoist, engine room, machine shop and throughout the mine. This is intended partly as a precautionary measure against possible fires, the timbering being dry. A telephone system will extend throughout the underground workings of the mines and will connect with the company offices in Tombstone.

GILA COUNTY.

(Special Correspondence). — The Pinal Copper Co., composed chiefly of St. Louis, Mo., men, are opening the old Black Copper mine, 8 miles west of Globe. The ledge ranges from 25 feet wide, is at a contact of rhyolite and schist, carries copper oxides and chrysocolla and is supposed to be on the same belt as that of the Black Warrior. Supt. L. C. Mott states that the ores run from 16% to 20% copper and that they are well suited to leaching. Former owners worked the mine through an incline shaft 340 feet deep. This company has sunk a vertical shaft 250 feet deep, from which crosscuts and drifts have been run on the 100 and 200 levels. A gasoline hoist is in use.

W. M. Williams of Globe is developing a property 16 miles from San Carlos which makes a good showing of iron and copper sulphide ores, carrying good values.

The United Globe Co. use a furnace blower at their Gray shaft to supply air to the different levels, conveying it down the shaft through a 10-inch pipe and from the latter through 8-inch pipes to the levels.

Paul Michaelson, an employe of the Old Dominion mine, at Globe, has devised a swinging frame for a cut-off saw, of use in framing mine timbers. The frame that holds the timber to be sawed swings on a pivot under the saw and is gauged by a graduated scale, which enables the sawyer to cut an exact bevel at any required angle. He has also devised gate bars at the collar of the shaft which are considered an improvement in protection devices against accidents.

Globe, Jan. 15.

S. Alexander, who owns the Alexander property, consisting of two claims near Globe, says he has struck a body of ore 18 inches wide which assays 71% lead and 100 ounces to the ton.

GRAHAM COUNTY.

The Shannon Copper Co. has decided to commence the erection of a 500-ton concentrating plant at Clifton as soon as the plans can be drawn by W. Carkeek, of Butte, Mont., who is engaged in their preparation. It is estimated that the concentrators and converters already installed will save the company from $3 to $5 per ton on every ton of ore treated, and that at least $300,000 saving will result by erecting the new plant at once, over and above what could be made during the time which would necessarily elapse before it could be paid out of the net earnings of the smelter alone. Upon the completion of the new plant the company will be able to treat at least 700 tons of ore per day. The amount required to complete these new improvements to the plant will be $600,000.

MARICOPA COUNTY.

The Lime Creek Copper Co. is erecting a thirty-ton smelter at Alhambra and expect to start it up in February.

Work on the Independence group, near Morristown, has been started by B. Swenginger. About 600 feet of work has already been done on these claims. The ledge varies from 6 inches to 3 feet and is a free gold proposition.

MOHAVE COUNTY.

Ewing & Heimrod of Kingman, who have bought the Ruby group of gold claims on the Big Sandy from W. H. Chapman, are starting work on the mines. A run of fifty tons of ore will be made, to test methods of extraction. A survey is to be made for a water power from the Sandy canyon. Ewing & Heimrod contemplate the erection of a milling plant, with concentrators and cyanide outfit.

PIMA COUNTY.

A. J. Shotwell, president of the Rescue Copper Co., located at Ajo, states that his company will open their copper mine and employ a large force of men.

SANTA CRUZ COUNTY.

The sale of the World's Fair mine in the Harshaw district near Patagonia, and owned by F. Powers, is reported for $500,000.

YAVAPAI COUNTY.

F. M. Williams has sold the F. Lee and J. Wheeler mines, near Bigbug, for $7000, to George & Co., of Los Angeles, Cal. About $2000 worth of development work has been done on the two mines, principally upon the Fitzhugh Lee, upon which there is a shaft 70 feet deep on a vein of ore 10 feet wide which carries about $18 per ton gold and silver, principally gold.

YUMA COUNTY.

The Planet copper mines, situated on Bill Williams Fork, 150 miles northeast of Yuma, are to be operated by Eastern people. Supt. J. A. Carrow has taken in a steam hoist to sink a two-compartment shaft to 500 feet. The Planet mine, it is said, was one of the first copper mines operated in Arizona, having been producing back in the '60s.

CALIFORNIA.

ALPINE COUNTY.

The Morning Star Syndicate propose to tunnel on the Morning Star group, near Loope, to intersect the copper lode at a depth of 500 feet below the deepest present workings in the mine.

BUTTE COUNTY.

At Oroville the machinery is being placed on three new dredgers, two on the west side of the river and one on the Oroville side. The west side dredgers are situated in South Thermalito and are owned, one by the Oroville G. D. & Ex. Co., the other by the Boston & Oroville Co. That on this side is the Wilcox-Leggett dredger. Another new machine is soon to be started by the Wilcox-Leggett Co. Work has been begun on the new machine shop near the Continental dredger, which is undergoing extensive repairs.

CALAVERAS COUNTY.

At the Beatrice mines, near Murphys, operations have been commenced after a shut down of some weeks.

Work has been resumed at the Yellow Aster mine, at West Point, owned by G. Congdon. He is extracting high-grade ore.

The Texas mine, at West Point, worked by Sheridan & Rumperi, is showing in development some very rich ore.

At the Paragon mine, at West Point, for a long time idle, preparations are being made to resume operations.

At Sandy Gulch a mine is owned by F. Walker of Pine Grove, who is extracting ore and grading a site for an arrastra.

Fifteen tons of ore from the Continental mine at West Point were recently worked in the Paragon mill with such good results that the operators propose to erect a stamp mill near the mine. A few men are employed extracting ore.

At the Gallna mine, near West Point, under bond to J. W. Shute and P. Porovich, a ledge of good ore has been discovered 2 feet wide.

EL DORADO COUNTY.

Development work is being made with two shifts on the 1000-foot level at the Josephine mine at Volcanoville, owned by the San Francisco M. Co. The tunnel is in 553 feet and for the last hundred feet is alongside the ledge, which shows 8 feet wide. Supt. J. M. Nougues, Jr., is preparing to pipe the mine water from this tunnel and from the No. 4 tunnel to obtain a 500-foot head for power to drive a Durkee electric drill. It is also contemplated to drive a crosscut at 625 feet in the tunnel to a point 165 feet west to intersect the footwall ledge.

Work has been resumed at the Boulder mine, near Placerville, four men being employed in running a tunnel to tap the ledge.

The Gignac gravel mine at Texas Hill has started up for the winter's run. Two hundred inches of water is being used under 250-foot pressure.

At the Craddock mine, Placerville, W. Craddock and G. Swansborough are working the vein averaging from 1 to 6 inches wide but exceedingly rich and continuous.

The Giebenhain Bros. are opening up their mine near Placerville. They propose to put up a mill at the mine in a few months. A three-ton test of the ore yielded $37.15. None of the ore or porphyry tested, it is claimed, has gone less than $12 per ton.

Development work at the Levitt mine, on the Mother Lode, near Kelsey, is being done by F. Levitt of Los Angeles. The mine is on a well defined ledge of free-milling ore, and the owners contemplate putting additional machinery on for further development work.

P. Stingle has returned from Boston, Mass., and it is said comes prepared to commence development work immediately on the old Chaparral mine, now known as the Golden Queen, at Kelsey.

MARIPOSA COUNTY.

In 1900 the Whiterock copper mine was discovered near Lewis P. O. The principal owner is C. C. Burrill of Ellingworth, Maine. E. L. Foster, late of the Hite mine, is Supt. The shaft is now over 150 feet in depth and has disclosed a large body of carbonate ore that it is claimed assays about 50% copper.

The copper mines, near Lewis P. O., owned by O. R. Sydney of Green Mountain, are working. The Lone Tree mine below the Star group is being worked and some copper oxide ore is being taken out. At Green Mountain Mr. Sydney is sinking a shaft to connect with a 600-foot tunnel.

MONO COUNTY.

J. B. Kennedy is milling fifty tons of ore taken from his lease in the Snowflake mine at Bodie at the Syndicate mill.

NEVADA COUNTY.

High-grade ore has been struck on the 400-foot level at the Texas mine at Grass Valley. The Texas mine has had expended on it over $150,000 in the way of machinery and development work.

New hoisting and pumping machinery and suitable buildings will be put on the La Suerte mine, near Grass Valley, to replace the old plant destroyed by fire in November last. Supt. Kirkham will have the shaft retimbered as soon as the machinery is in place. Sinking and drifting will then be resumed.

J. O'Connor, Supt. of the Conlin mine on Osborn Hill, near Nevada City, is planning to install considerable machinery, including air compressors, at the mine. All the drilling is now done by hand.

Operations are to be started at once on a mine situated on Selby Flat and owned by W. J. Britland of Nevada City. S. Blight of Grass Valley has been appointed Supt.

PLUMAS COUNTY.

J. J. Sullivan, representing the company which owns the Blue Bell copper mine at Genesee, shipped 18 tons of ore to the smelting works which yielded $84 per ton. An oil-burning smelter is to be placed on the mine for the reduction of the ores.

The Plumas C. & S. Co. at Genesee have several men, under the superintendence of C. L. Adams, sinking a shaft on a 4-foot vein. Most of the owners reside in either Minneapolis or St. Paul, Minn.

E. N. Mitchell and G. W. Brunk are developing a gravel channel near Genesee.

J. C. Borden & Son are developing the Pilot mine at Genesee which contains several ledges, the ore deposit being from 6 to 9 feet wide.

G. F. Brown reports a vein 6 to 8 feet wide in the Green ledge at Genesee. The ore contains gold, copper and silver.

On Mt. Jura, near Taylorsville, C. D. Biglow has made development of copper ore in a vein reported to be 5 feet wide. He is sinking a shaft.

SAN DIEGO COUNTY.

At the American Girl mine, in the Cargo Muchacho district, near Yuma, they are now running three sets of rolls and have lately installed eight concentrators It is stated that below the 350-foot level the ore has changed to the sulphides. The principal vein has a width of from 30 to 50 feet. They are now sinking to the 600-foot level. The ore runs from $6 to $8 in gold per ton. The company has a 12-mile pipe line from the Colorado river to the mine.

SHASTA COUNTY.

On the Oro Fino mine, near Shasta, the drifts are running on the ledge through nearly solid sulphurets that assay very high. C. H. Behrens, Supt, states that they will soon make a shipment of ore to the smelter.

SIERRA COUNTY.

J. Bothwell and associates have discovered a quartz ledge carrying high-grade ore on the bank of Jim Crow canyon, near Downieville, by sluicing off the surface.

J. G. Wolf, formerly at the Gold Bluff mine at Downieville, has bought the interest of F. R. Wehe in the Sailor Boy mine, formerly the Liberator, at Deadwood.

C. B. Wingate of Oakland, representing the English owners of the Thistle Shaft gravel mine, at La Porte, has the drain and working tunnel now in about 1500 feet and is making about 70 feet a week. The tunnel, when completed, will be 5000 feet long.

SISKIYOU COUNTY.

A large number of asbestos claims have been located in the Siskiyou mountains at the head of a branch of Sciad creek, north of Sciad P. O.

The Hidden Treasure mine, owned by J. Russell, located on Boulder creek, near Etna, has been bonded to H. L. McAllister of Etna, who proposes to commence work in a shaft on the ledge. The ore, it is said, requires to be smelted to obtain the values.

TRINITY COUNTY.

(Special Correspondence): At the Brown Bear Supt. Dobler keeps the 10-stamp mill running to its full capacity from upper and lower works. The usual winter force of 50 men is employed.

Deadwood Jan. 18.

The Hay Fork gravel mines are reported to be showing excellent prospects. The company has sunk 12 feet through good pay gravel and has not yet encountered bedrock. In the early spring work on the 21-mile ditch will be commenced. The ditch will take water out of Hay Fork creek.

The water of East and West Weaver creeks has been turned into the Sweepstake ditch and pipe line and through them into the reservoir on Oregon mountain. To the upper giant is a fall of 300 feet. Water has been run in the mines and in four hours 4000 cubic yards of gravel was worked.

TUOLUMNE COUNTY.

At the Olsen copper mine, near La Grange, the Santa Cruz Co. is working five men. Six carloads of copper ore have been shipped. Among the improvements soon to be made at this property is the putting in of a steam hoist.

A. Brown of Milton, representing San Francisco people, has been negotiating with claimants for the bed of the Tuolumne river with a view to mining it with dredgers.

Over 200 men are at present employed at the Shawmut mine at Jacksonville installing the machinery and working on the mill, which when completed will have 200 stamps.

The Jumper and App mines at Quartz are running with full crews, 75 men being employed at the latter with 40 stamps going in the mill.

At the Harvard mine at Jamestown the hoist house at No. 1 shaft is completed and covered awaiting the machinery. In this shaft they are raising from No. 7 to No. 5 level. Three skips, each 2 tons capacity, will be placed in No. 1 when hoisting is resumed, in place of the cages heretofore used.

The Mohican mine is on the Tuolumne river a few miles southeast of Carters. F. Chappellet, Jr., is manager. The company has received returns from its second run of three weeks and four days, amounting to nearly $6000. The rock worked has averaged over $20 to the ton. The 5-stamp mill is driven by a gasoline engine. The principal stockholders, residents of Oakland, are H. C. Chesebrough, G. H. Collins, G. W. Fisher, F. A. Leach, J. W. Classen and A. Higgins.

The Star M. Co., operating near Sonora, under Supt. Olsen, is preparing for the immediate resumption of work.

YUBA COUNTY.

It is reported that arrangements have been completed with J. O'Brien for land required for retaining hydraulic debris on the Yuba river at the figure originally offered by the Debris Commission. The suits to condemn the property will now be dismissed.

COLORADO.

BOULDER COUNTY.

The Montezuma tunnel, at Wall Street, now in 400 feet, is making regular shipments of ore, said to be going from thirty to fifty ounces in gold per ton. The vein runs 2 to 3 feet.

The Trojan mine, at Wall Street, is said to be producing more and better ore than ever before. The mine is owned by Meyer Bros. Two leads are being worked through the shaft down 250 feet.

The Smoky Hill lode, at Wall Street,

owned by the Ermanie G. M. Co. of Allentown, Pa., has a new shafthouse and plant. Steam drills have been substituted for hand labor. The shaft is now down 200 feet. G. E. Lake is manager.

CLEAR CREEK COUNTY.

Work has now been commenced on the Mint property on McClellan mountain, near Georgetown. A contract to drive the crosscut tunnel has been let for 1400 feet and three shifts of men are at work. W. H. Ross is manager.

G. L. Torrey of Colorado Springs has been arranging for operations at the King Edward's mine, at Idaho Springs, by installing a plant of machinery to push the tunnel ahead to a group of lodes in forty-three claims owned by his company.

The Detroit M. & R. Co. of Idaho Springs has been incorporated, capital $75,000, by W. P. Gillingham, T. B. Crow and C. H. Gillingham.

W. W. Kirby of Colorado Springs says of operations at the Lucania tunnel, near Idado Springs, that it is being driven by hand at the present time and making 2 feet per day. A compressor and machine drill will he added. The Kinda, Specie Payment and Champion veins will be cut and opened at a depth of from 1000 to 2700 feet below the outcrops.

EAGLE COUNTY.

J. Sands of Leadville is opening up the old Bleak House mine, at Red Cliff, with J. W. Stonebreaker as Supt.

EL PASO COUNTY.

The annual cleanup at the Economic mill at Colorado City is under way. The overhauling ordinarily results in the recovery of several tons of powdered quartz and containing from $10,000 to $20,000, which is shipped to a smelter for reduction. It has been recently demonstrated that this mill, which has been treating only Cripple Creek ores of low grade, is capable of treating mineral of any quality. A car of high grade was delivered to the mill hy mistake and it was decided to run it through as an experiment. The ore was subjected to the usual nine-hour treatment in the barrels, after which the barrels were recharged and the material run through again. The result was most satisfactory, as much gold being obtained as is usually secured by the smelters. But the second run, which seemed necessary, made the operation rather expensive.

GILPIN COUNTY.

B. Campbell, of the Cashier G. M. & R. Co. at Central City, says returns from a lot of Pittshurg ore gave values of twenty-eight ounces gold and 14% copper per ton. The second-class ore brought from $80 to $100 per ton. The ore came from the shaft heing sunk, and will more than exceed the cost of sinking it. Manager McCann reports for the month of December, 1901, the output of ore from the Kansas-Burroughs mines at Central City was 2482 tons. The shaft is now over 1400 feet in depth. Steam pumps are being used for freeing the mine of water.

C. W. Baldwin and associates of Chicago, Ill., have bought the Boer tunnel, at Black Hawk, consisting of a tunnel site and ten claims, and the work of development has been commenced, Mr. Baldwin being in charge. The tunnel has been driven 600 feet into the Dory hill and has opened several veins of good ore.

Omaha, Neh., people are starting up the Foot & Simmons mine, at Central City, under the management of H. Higginbotham, with R. Morris underground Supt. The property has been idle for eight years, and the shaft is being retimbered. The operators figure on installing a gasoline hoisting plant of sufficient capacity to reach a depth of 1000 feet.

GUNNISON COUNTY.

The Dubois Tunnel M. & D. Co., near Gunnison, has its tunnel in over 1200 feet and has cut four large veins. The first is 14 feet wide and, it is claimed, averages $7.20 in gold; the second, 3 feet, with the same value; the third and fourth are larger and average higher. The company proposes to put in a large concentrating mill this summer.

The Forest Hill Con. M. Co. owns about 300 acres of patented mineral ground at Tin Cup. The principal development is the Springfield shaft, over 400 feet in depth. From this shaft six levels run off into ore, which averages hetween $15 and $20 a ton. The company has recently completed a thirty-ton concentrating plant. The Springfield shaft ore is concentrated seven to ten tons into one, making three shipping products. The first runs $75 in lead, the second $60 in iron and lead and the third 40% to 50% in zinc. The Tourist shaft ore concentrates ten to twenty tons into one and produces a concentrate valued at from $50 to $150 per ton.

Three shifts are worked on the North Star tunnel at Whitepine. It is to go into the mountains 3800 feet and open the May-Mazeppa vein of lead ore at 400 feet depth. The Akron, Ohio, M. & M. Co. is doing this work.

HINSDALE COUNTY.

The new compressor lnstalled hy the Auric M. Co. on the Ute and Ulay mines at Lake City has been started up. The new compressor weighs 100 tons. It is guaranteed to run twenty 3½-inch drills. The new tunnel is in 2700 feet and is still being driven ln ore. A second upraise will soon he started from the lower tunnel to connect with No. 4 tunnel, a distance of 285 feet.

LAKE COUNTY.

Operations on the Bug Gold mine at Leadville will be resumed, according to Manager W. P. Dewey, who states that the work done late in 1901 shows a large hody of good milling ore, with the principal value in gold. New York people have become interested and arrangements are to be made to open up on a large scale. It is likely that a mill will he built.

At the Hap Hazard mine in Lake Park the new plant of machinery is in place. The main vein has been developed in a winze. The vein ls oxidized near the surface, but changes to a sulphide as depth is gained. An important feature of the mine is the immense quantitles of low-grade ore that can be quarried out at the surface. This will carry $4 to $5 a ton free gold, which can be recovered by cyaniding. It is expected that the new company will put a mill in early in the summer months.

The Big Evans M. Co., at Leadville, has started a new shaft which is now down more than 100 feet. The territory has never been explored, hut the outcroppings of the contact can be traced on the northern portion of the company's ground.

The Canterbury M. Co. of Leadville is negotiating for a larger plant of machinery. Arrangements are heing made to put in an electric plant with a new boiler and other necessary machlnery. While figuring on a plant of new machinery, the company will look into the matter of securing electric power for its hoister as well as drills.

It is reported that the A. Y. & Minnie and the R. A. M. mines at Leadville are to close down. The A. Y. & Minnie last year produced 19,000 tons of sulphides and 924 tons of zinc. The Small Hopes combination, of which the R. A. M. is a part, produced 32,280 tons of sulphides, 2402 tons of oxidized iron, 1727 tons of carhonates and 1074 tons of zinc.

LARIMER COUNTY.

The Empire mine at Bettls, 8 miles west of Fort Collins, has developed into a regular shipper. It is owned by New York and Denver people, Mr. Stark of the latter city being managing director. Since November the mine has shlpped over 800 tons of copper ore to the smelters. Additlonal men and machinery are being put in.

SAN JUAN COUNTY.

E. W. Walter, Supt. of the Kendrick & Gelder Smelting Co. at Silverton, is getting blds and estimates for machinery for the construction of a 400-ton reduction works or concentrating mill, lncluding an aerial tramway, for the Oliver Reduction Co. at Silverton.

Reports from the Kankakee mine, 18 miles east of Silverton, at the source of the Rio Grande river, 11,000 feet ahove sea level, predict a new mining district there. The tunnel is in 300 feet. In the discovery working, a 12 inch streak of telluride ore, the returns from the smelter were $100 gold to the ton. Mill runs, it is stated, gave an average for the entire surface ore body of 3.80 ounces gold and 4.07 ounces silver. The property is owned by a company of Denver people, of whom J. Frank is the president.

SAN MIGUEL COUNTY.

The new mill of the Telluride Reduction Co. will begin operations about Feb. 1. The portion of the mill which is to he started is the experimental plant, which will he in charge of Head Assayer Faber. Experiments to test the bromination process for the reduction of ore will be conducted. The mill, as it is now constructed, will handle fifty tons of ore daily, and it is the present intention to enlarge the capacity to 500 tons daily by June.

TELLER COUNTY.

Cinnahar specimens are being taken out of the E. Porter Gold King mine on Gold hill, Cripple Creek. No commercial amount of it has been found.

Work has been started on the 2000-foot shaft on the Plymouth Rock claim at Cripple Creek, owned hy W. S. Stratton.

Ore containing free visible gold ls being taken from the Ellen McGregor mine of the Fair Chance M. Co., at Cripple Creek, rlght on the surface. The mine was operated and a shaft sunk 300 feet in the early days, though no ore was ever taken from lt. The discovery was made in work done for the company; J. Kelley is Supt.

IDAHO.

BLAINE COUNTY.

The Torbanehill M. Co. has been incorporated in Salt Lake City, Utah, to develop the Torbanehill group of seven claims situated in an unorganized mining district in Blaine county. L. G. Young is president and D. Smellie secretary and treasurer.

BOISE COUNTY.

Stevens Bros. have bonded their Klondike gold quartz claim to H. Pope of St. Louis, Mo., who will develop it. An air connection has been made hetween the tunnels, and the lower tunnel is being pushed ahead.

IDAHO COUNTY.

Operations by the Boston & Seven Devils Co. at their Decorah mine near Landore are confined to the 335-foot tunnel, which is being retimbered throughout. The buildings near the mouth of the tunnel are being rebuilt. The work is in charge of Superintendent T. G. Jones.

The Thunder Mountain M. & M. Co. has been incorporated in Spokane, Wash., to operate a property in the Thunder Mountain district. The capital is $50,000, and the trustees are J. W. Shearer, J. H. Conklin, J. B. Johnson, J. F. Pasold, E. A. Patrick, L. L. Jones and F. W. Girand. J. F. Pasold says the property is 55 miles southwest of Warren and is located on a vein 30 feet wide between well defined porphyry walls with outcroppings exposed for 1200 feet. Average samples, he says, assay from $4.13 to $28 a ton. It is the intention of the company to commence work on the mine in the spring and to erect a 10-stamp mill.

The Midas mine at Dixie has shipped $3000 in gold bullion. The mine is a medium grade free milling proposition and has a large ore body, with a considerable tonnage already exposed. It is owned by Finch & Campbell of Spokane, Wash.

Reports from the Thunder Mountain gold district show that development work is being continued in spite of the deep snow and confirm the first reports of richness and extent of the fields. It is stated that it is almost impossible to pack in provlsions over the trails in winter. At Mackay, Boise, Salmon City, Ketcham and Weiser hundreds of prospectors are already gathering to start in as soon as the trails are passable. A stage line from Ketcham, to he started about May 1st, has been arranged for.

The Crooked Rlver M. & M. Co. is doing development work on its group of quartz and placer claims at Elk City. A 10-stamp mill is at Stites to be frelghted in and installed. The quartz has been developed and is said to show large hodies of milling ore.

R. W. Purdum of Nampa has concluded the sale of the Hidden Treasure and Rainbow groups of claims at Thunder Mountain to a Pittsburg, Pa., company, which has put twenty-five men at work on the Hidden Treasure group of three claims, and another force on the Rainbow group. A 3500-foot tunnel will be driven on the claims. Assays of the ore give values from $6 to $9 a ton. If a good showing is made a 100-stamp mill will be put on the mines. The main office of the new company, of which Mr. Purdum is manager, will he located at Nampa.

KOOTENAI COUNTY.

Manager Ferguson of the Rebate mine, near Hope, in the Pend d'Oreille country, reports a rich strike of gray copper and hlack sulphurets, assaying over 700 ounces in silver to the ton.

OWYHEE COUNTY.

The mill on Twilight Gulch, near Flint, built by White Bros. and D. Adams, has been started up. The mill is a 5 stamp battery from which the pulp runs over two Frue vanners, one behind the other, and thence over tables, the values heing saved in concentrates. It is expected to reduce ten tons of ore to one, in which shape it will he shipped to smelters. The owners estimate that the concentrates will he worth about $1000 per ton.

The owners of the Addie mine have hought the Calaveras, Omega and Josephine claims at Silver City from J. S. Meyer, and have incorporated the property as the Addie Con. M. & M. Co. The company is prepared to erect a mill and do extensive work.

SHOSHONE COUNTY.

The Hecla mine has resumed operations. Since it was closed down, almost a year ago, a large force of men has been employed ln development work, but this week about twenty more were put on and mining was resumed. The mill at Gem will not he started. The ore will be concentrated in the Standard mill.

MONTANA.

FERGUS COUNTY.

On the Oro Grand claim at North Moccasln, owned by W. Smith, exploration work has developed lt to he a continuation of the ore deposits on the cyanide belt of the North Moccasin.

A new sapphire field has been discovered in the northeastern part of this county in Blood creek. Blood creek is a small stream located in a wild and hroken country. All that locality is a series of had lands, and, being an arid, barren region, it is almost totally devoid of settlement. According to C. Deo of Lewiston, the discoverer, the gem-bearing district covers an area of 15 miles long and 4 miles wide. The stones hrought out have been pronounced sapphires of an excellent quality, similar to the white sapphires found in the Yogo district.

FLATHEAD COUNTY.

(Special Correspondence).—The Butte Co., which is drilling for oil in the Flathead county oil fields, has its well now down ahout 300 feet.

The Rustler M. Co., with D. P. Bowers as manager and a force of thirty-five men, have hegun operations at the Snow Shoe mine, near Lihby. The shaft will be sunk 500 feet deeper. The concentrator is being repaired, and, when in shape, a full force of about 200 men will probably be employed. The Snow Shoe has been closed down during the past year.

A new tunnel is being run on the Silver Cable property, two shifts being worked. It is planned to start up the mill in the spring.

The hydraulic plant for the Vaughan & Greenwell placer mine, on Libby creek, has been ordered preparatory to operating in the spring.

J. L. Scarlett of Lihby has had some tests made on ore taken from his Cedar group which show as high as $160 gold per ton. The ledge, it is claimed, has widened out from 2 to 5 feet.

The Mustang M. Co. of Spokane, Wash., has begun operations in the West Fisher mining district.

The American Kootenai M. & M. Co. have ordered an electric light and power plant and air compressor.

The Brick & Brannegan mine and mill are working full capacity. The ton value of the ore, it is reported, has increased considerably with the greater depth of working.

The plans for the new Mother Lode mill are being made in Helena. The mine is considered to show enough ore in sight to keep the proposed mill running for two years. The large ledge, which runs from 6 to 12 feet in width, is a free-milling gold-bearing quartz.

Libby, Jan. 15.

LEWIS AND CLARKE COUNTY.

A large hody of hlgh-grade ore averaging, it is said, upwards of $30 per ton in gold, silver and copper, with 10% lead, has been discovered in the Empire mine, near Marysville. The ore body is from 6 to 10 feet ln width and has been opened for over 110 feet in length. The gold in the ore is partly free and can be saved hy amalgamation; the remainder, and the copper and lead, by concentratlon. The Empire is under bond to the Superior & Montana Dev. Co., of Houghton, Mich.

NEVADA.

DOUGLAS COUNTY.

In the tunnel heing run by W. Virgin near Genoa, the rock encountered ls so hard that but 6 inches a day is made. It costs from $15 to $20 per foot to run lt.

HUMBOLDT COUNTY.

Supt. Miller is having some development work done on the group of claims near Golconda owned hy the Enterprise M. Co. Five men are employed.

LYON COUNTY.

A gold prospect has been discovered hy I. W. Johnson, near Cambridge, from whlch assays of over $300 per ton were obtained.

The report that the Nevada Reduction Works at Dayton would receive no more ore from Tonopah, as it was not worked up to the required standard, is not a fact. At the mill in Dayton the ore is steadily coming ln and the mill is working double shifts to handle it. Mr. Davis, manager of the mill, states that the mill is working the Tonopah ore to the required standard and that no complaint is being made hy the parties that ship the ore.

The Roger's cyanide plant at the Douglass reservoir is heing pushed to completion and is expected to he running by the 15th of February.

At the Bluestone group near Cambridge, owned by the Excelsior Copper Co., no work is being done above the 200-foot level. On this level a drift has been run about 330 feet from the bottom of the winze, and the last 45 feet is in chalcopyrite ore averaging, it is claimed, not less than 10% copper.

At the Ludwig mlne, near Cambridge, ore carrying 12% copper is heing taken from the 100-foot level and worked ln the company's smelter. On the 200-foot level it is claimed the ledge ls 20 feet wide of oxide ore which averages 17% copper. The ore contains sufficient iron for a flux and there is also in the mine a large

ledge of calcspar carrying 45% lime and 4% copper.

NYE COUNTY.

The Tonopah M. Co. is taking up the work on the mines at Tonopah where the leasers left off and will sink a number of shafts. A new working shaft has been started about 200 feet north of the Mizpah ledge in the hanging wall. It is the plan to erect over this main shaft a new steel hoist with a 150 H. P. double reel cross compound hoisting engine and a large compound air compressor. The small gasoline hoist at present at shaft on the Mizpah ledge will be used for a prospecting shaft, which will he sunk quickly as possible to prospect several veins to a depth of about 600 feet. The shaft on the Cutting lease will also be sunk, as that will cut the rich ore shoots towards the center of the Mizpah ledge. It is contemplated to start a deep working shaft on the Valley View claim in the near future.

ORMSBY COUNTY.

A 5-stamp mill is to he erected in Carson for custom work and sampling.

WASHOE COUNTY.

It is claimed that there are at least twelve mines in Olinghouse district, which are sufficiently developed to keep the mills there running constantly on low-grade ore.

R. R. Arnold, general manager of the Colorado-Nevada M. Co. of Cripple Creek, Colo., states that before March a large steam hoist will be erected over the company's shaft at Wedekind.

WHITE PINE COUNTY.

The Olympic group of mining claims at Cherry Creek has been bonded to C. E. Hayden of Colorado Springs, Colo., at $20,000.

NEW MEXICO.

GRANT COUNTY.

J. L. Schofield and C. Derbyshire have leased from the Pinos Altos G. M. & M. Co. the tailings of the old Bell & Stephens mill at Pinos Altos. They have started treating the ore by concentration and amalgamation.

Work on the Gettyshurg group of twenty-one claims at Burros has developed a vein of ore 3 feet wide which runs 15% in copper and a few ounces in silver.

LINCOLN COUNTY.

A rich strike is reported near Nogal. From a mill run of 500 pounds of the ore the returns amounted to $1200.

SANTA FE COUNTY.

J. H. Cook, in charge of the electric power plant of the Cochiti G. M. Co. at Madrid, has made a continuous run of 1752 hours, closing down for a few hours. The engine of the plant is 800 H. P. The three-phase system of transmission is used, delivering from 400 to 600 H. P. at the Albemarle mine, 35 miles distant.

OREGON.

GRANT COUNTY.

W. C. Rutter, president and general manager of the Kittanning M. Co. of Seattle, Wash., has arranged for the development of the Big Four group of mines, near Granite, on an extensive scale, stating that hetween now and next July his company expects to spend a large sum in development work.

The Concord mine, near Granite, is reported to have heen sold to Godfrey & Tahor, the owners of the Red Boy, for $300,000. C. B. Wade of Pendleton is the principal owner of the Concord.

JACKSON COUNTY.

A quartz vein, the ore of which yields from 35 cents to 50 cents per pan in free gold, has heen uncovered in the Dry Diggings district, near Grant's Pass, hy Andrews Bros. The discovery was made by the continued sinking of a shaft heneath a pocket. Instead of ceasing work after the pocket was worked out, the shaft was continued down and struck a rich ochre seam which, on heing followed, developed into a 6-inch vein of soft crumbling stuff, with the free gold richly sprinkled through all parts of it.

W. Mayfield, the discoverer of the rich Mayfield cinnabar claim in the Meadow district, has made another rich strike. At a depth of 10 feet on the Hydrargyrum he has uncovered a ledge that has a width of several feet and carries 30% mercury.

JOSEPHINE COUNTY.

The Gold Bug mine, situated on Mt. Reuhen, near Glendale, is steadily operating with its 5-stamp mill. About 20 men are employed. The company has put in a cyanide plant to handle the stamp-mill tailings which carry assay values of about $15 per ton. A depth of 300 feet has heen reached in the shaft and the ore hody has increased in size and richness with the depth. A new hoist is soon to he added and other improvements in equipment will be made.

The Lucky Queen mine on Jump Off Joe, near Grant's Pass, is now being developed, with C. D. Crane as Supt.

G. Bolt, owner of the Sugar Pine mine at Gallce, is taking out ore in which free gold is visible. The mine is under bond to Dr. Ray of Grant's Pass and is being opened hy a 600-foot tunnel.

UTAH.

BEAVER COUNTY.

W. H. Penrose of Salt Lake City has made arrangements for erecting the new shaft house on the Estelle at Milford. He expects to have the new 25 H. P. hoist in operation hy the 15th of February. A well is to be sunk to provide a water supply for the mine.

The Copper Mountain M. Co., operating at Frisco, has been reorganized in Salt Lake City and B. T. Lloyd made secretary and treasurer. The company owns six claims, with a shaft 275 feet deep sunk on the ledge. The ore runs, it is claimed, from 9% to 15% copper, seven ounces silver and from $1.60 to $2 in gold per ton.

IRON COUNTY.

The new mill on the Ophir mine at Stateline has been closed down, it is stated, because of insufficient water supply, and to increase which a pipe line will be constructed at once. Work in the mine is being continued.

JUAB COUNTY.

The Tintoretto M. Co. has heen incorporated at Salt Lake City, capital $30,000. B. B. Mann is president and H. O. Jackson secretary and treasurer. The company owns the Valley View and Valley View Fraction claims near Tintic.

F. Morehouse, Supt. of the Martha Washington mine at Silver City, says that from 90 feet depth in the new double-compartment shaft he is crosscutting to the vein that will be tapped at a depth of 246 feet on its dip.

A. D. McLean, Supt. of the Trapper's Pride mine at Gold Mountain, owned by the Madsen G. M. & M. Co. of Salt Lake City, reports that from No. 1 tunnel over 20,000 tons have heen stoped for the mill, which will he erected during the summer, while No. 2 tunnel has been driven into the group a distance of 700 feet.

SALT LAKE COUNTY.

The New Hope M. Co. has been incorporated at Salt Lake City, capital $900. The officers are J. E. Frick president and A. Kee secretary and treasurer. The company has a lease on the Liheral claim at Bingham.

It is stated that the New England G. & C. M. Co., operating the Nast group at Bingham, has decided to sink another 100 feet to 200 feet below tunnel level. The working force at the mine has been increased.

SUMMIT COUNTY.

H. Bowdich, Supt. of the O'Donovan group, near Park City, for Jones & Walker, is sinking the shaft on the Spring claim of the group.

UTAH COUNTY.

Z. Lot, M. Mills and W. Davis, who have heen working on a prospect in the Wasatch range, near Provo, claim to have struck ore running high in gold.

WASHINGTON.

CHEHALIS COUNTY.

Some fine specimens of minerals are reported to have been discovered on the Clearwater river in the Olympic mountains. The specimens assay 20% copper, with traces of gold and silver. It is stated wages can he made in the placer digging. The country of the discovery is tributary to Hoquiam.

JEFFERSON COUNTY.

Gold-hearing hlack sand has been discovered near Fort Flagler which may be worked.

SPOKANE COUNTY.

D. L. Huntington, secretary and general manager of the Washington Water Power Co. of Spokane, has completed plans for increasing the capacity of its Spokane Falls power plant from 7500 to 15,000 H. P. The cost of the improvement is estimated at $500,000. The increase of the power plant is to furnish electrical power to the mines in the Cœur d'Alenes. Contracts have heen secured from the principal mine owners for at least 1500 H. P., to be used at once.

WYOMING.

CARBON COUNTY.

The cost of construction of the aerial tramway from the Ferris-Haggarty copper mine at Battle Lake to the smelter at Encampment, work on which will he commenced as soon as the material can he hrought in, will he ahout $300,000. Specifications are heing prepared and hids will be called for as soon as these are completed. It is reported that if this tramway is a success others will be put in connecting the smelter with the New Ramhler mine in Douglas Creek district, with Pearl, Colorado and other camps.

FOREIGN.

BRITISH COLUMBIA.

(Special Correspondence).—The granting of 200-foot claims at Atlin has greatly increased winter drifting. Ahout forty men are working on upper Pine creek—"tar flats"—in the north hank. Some sixty men are drifting successfully on the south bank of Spruce creek hetween discovery and 140 helow. Carmichael & Moran are continuing two successful tunnels on upper Otter creek. So far the ground averages $4 per cubic yard; size of drifts, 4½ feet width and 6½ feet high. Winter drifting is also heing pushed on Boulder creek, above the De Lamare hydraulic works, and into the bank from the hydraulic pit.

The hydraulic operations of the Minard Syndicate on McKee creek will he douhled in capacity. It is reported that a plant will he installed to work the henches controlled by Hawkins & Christopher. On Spruce creek the Columhia Hydraulic M. Co of Chicago is well installed to operate for a full season ahove discovery. The Blue Canyon property on upper Spruce creek has been taken over hy Lamhert, Jackson & Letherdale. A plant will be installed. S. O. Wheelock of Juneau will work the Gladstone lease an an individual property. The Gorgon lease will be worked hy Rohinson & Sageman.

The Consolidated Spruce Creek Placers will operate on a large scale on Spruce creek. The company will install a plant to cost $150,000 and bring water from Pine creek. W. M. Brooks is general manager, Mr. Blakemore Supt of construction. The company's head office is at Seattle, Wash.

Atlin, Jan. 9. J. B. H.

The Mines Exchange, Ltd., of Nelson reports that the Canadian Smelting Works will proceed at once with the construction of a refinery at Trail, of sufficient capacity to handle the present bullion output of British Columhia.

The Canadian Pacific R. S., which last summer bought the group of iron properties near Kitchener, has taken over another group of four claims at the same point, paying, it is reported, $25,000 cash.

The ore shoot recently struck on the Ottawa mine at Slocan has been drifted on 21 feet and two carloads of ore, carrying 1329 ounces of silver, 1½% copper and ½% lead to the ton, is being shipped to the smelter. The vein is 2½ feet wide of solid ore, the above being given as an average value of the entire vein.

The total exports of ore from ten properties in the dry ore belt in the Slocan during the past year were 6514 tons.

The following is the estimate of the output for 1901 for the southern portion of Yale and Kootenay:

District.	Tons.	Value.
Nelson	105,000	$ 850,000
Slocan Lake	14,000	1,250,000
Lardeau	3,232	450,000
Ainsworth	22,500	1,750,000
Trail Creek	293,201	3,811,000
Boundary	371,832	3,750,000
East Kootenay	25,000	852,200
Mines not reporting	....	350,000
Totals	805,765	$13,063,200

The tonnage of ore smelted at the British Columbia Copper Co.'s smelter at Greenwood since it started work last February was 117,565 tons. This quantity represents ten months' run of a single furnace of a nominal capacity of 250 tons, the last month's run heing a record one, totaling 13,098 tons, or 422 tons a day.

On the advice of Engineer Blakemore the Similkameen Valley Coal Co. recently purchased nine more quarter sections of coal land, on which they have coal that will coke, giving a return of 75% of fixed carbon.

A lease and bond has heen taken by G. W. Holmes of Nelson on the Queen group of gold claims adjoining the Yellowstone mine. The lease calls for 15% of the receipts from ore shipments and $50,000 for the mine. It is intended to use the Yellowstone mill for the reduction of the ores.

The bond on the Tamarac group, Slocan, has been lifted and the deeds turned over to the company. The price paid for the property was $18,000.

W. Harvey has bonded the molyhdenite claim owned hy W. Brasch of Nelson and located in the Slocan. The price stated is $2000 cash at the end of three months or $4500 at five months.

Nelson, Jan. 10.

Trade Treatises.

THE merits of the Truax automatic ore cars are finely shown in a hooklet just issued by the Globe Iron Works of Stockton, Cal, who have the Pacific coast sgency for their manufacture and sale. The hook tells ahout all any one wants to know on this subject, is handsomely illustrated and will he sent to any address on request.

Personal.

W. H. WILEY of Idaho Springs, Colo., is at Tucson, Ariz.

J. A. KIRBY succeeds J. Keetly as Supt. Little Bell mine, Park City, Utah.

E. W. WALTER will he general manager Oliver Reduction Co., Silverton, Colo.

C. L. HENRY has heen elected president Technical Society of the Pacific Coast.

W. R. SHILLING has been appointed Supt. American G. M. Co., Ogilhy, Cal.

DR. HAANEL is in charge of the new government assay office at Vancouver, B. C.

HARVEY HARDY is now Supt. Hecker mine, Summerville district, Emery county, Utah.

W. WATSON of Quincy, Cal., has gone to Magdalene, Sonora, Mexico, to remain two months.

CHARLES L. LANO has resigned as Supt. of the Mack Con. M. Co. at Big Oak Flat, Cal.

C. B. DERBY, Supt. of the Inyo Marble Co. at Marmol, Nev., is sojourning in San Francisco, Cal.

WILLIS MCCORNICK of Utah has gone to his Siherian mining property, where he will remain till 1903.

J. LUCE this week began operations at the Hardie Mt. Cinnibar syndicate, Hardie Mountain, B. C.

A. A. GRAY is Supt. of the Gray-Wing drift placer mine, near Mormon Island, Sacramento county, Cal.

H. C. ANCHOR of Boise City, Idaho, is in Owyhee county of that State examining several mining properties.

W. H. STORMS, Supt. Baliol mine, Amador Co., Cal., has returned there from a visit to San Francisco.

H. A. SHIPMAN, general manager of Stratton's Independence mine at Cripple Creek, Colo., is in New York.

W. R. MARDEN, M. E., of New York, has returned from Siheria and is in San Francisco, Cal., en route home.

H. C. BELLINGER, late smelter Supt. Montana Ore Purchasing Co., is succeeded by former Asst. Supt. Blossom.

G. DECKER of the Stillwell-Bierce & Smith-Vaile Co. of Dayton, O., has returned from a trip to Germany.

ROY D. HUNTER, Western manager Sullivan Machinery Co., has returned from Salt Lake City, Utah, to Denver, Colo.

G. T. COFFEY of London and G. Hothersall of Nevada City, Cal., are en route to the Klondike in the interest of London mining companies.

C. ROSE has heen appointed Supt. of the electric power plant of Cochiti G. M. Co. at Madrid, New Mexico, succeeding J. H. Cook, resigned.

J. W. NEILL, former manager of the United States Co. mine at Bingham, Utah, has returned to that place from several months sojourn in New York.

H. A. COHEN is at Bully Hill, Cal., arranging for the forwarding of the copper, gold and silver hearing hullion to Capt. De Lamar's new refinery in New Jersey.

JNO. M. BECKWITH, formerly manager Silver King, Calico, Cal., and subsequently of Goongarie, West Australia, is now general manager Las Minas, Becerrea, Lugu, Galicia, Spain.

D. S. RICHARDS has been appointed Supt. of the Liberal mine, near Hailey, Ida., succeeding C. W. Courtney, who has accepted engagement with a company developing Thunder mountain, Ida, mines.

Commercial Paragraphs.

JAMES LEFFEL & CO. of Springfield, Ohio, have an order for a 35-inch horizontal turhine to he shipped to the Caucasus.

THE American Steel & Wire Co. has created a pension department, which provides for the pensioning of old and faithful employes, in accordance with their terms of service. All employes of the American Steel & Wire Co., or its predecessors, are eligible The funds to provide pensions will he furnished hy the company. Between 25,000 and 30,000 men are employed by the company.

AN order hy the Santa Fe Railroad Co. calls for an engine that will haul a load of 2100 tons up a 50-foot grade. The rigid wheel hase is 20 feet and it weighs 137½ tons. On the drivers there is a weight of 230,000 pounds, or 115 tons. The type is the decapod, with ten drivers. To the top of the stack the height is 15 feet, and to the top of the hoiler 12 feet 7½ inches. The heaviest engine now doing mountain work for the Santa Fe has a weight of 163,000 pounds on the drivers, and a number of engines are heing huilt for the company which will have a weight of 191,000 pounds on the drivers.

Latest Market Reports.

SAN FRANOISCO, Jan. 23, 1902.

SILVER.—Per oz., Troy: London, 25 9/16d (standard ounce, 925 fine); New York, bar silver, 55½c (1000 fine); San Francisco, 55½c; Mexican dollars, 45½c San Francisco, 44½c New York.

COPPER.—New York: Lake, 1 to 3 casks, $11.25; carload lots, $11.00; Electrolytic, 1 to 3 casks, $11.00; carload lots, $10.87½; Casting, 1 to 3 casks, $11.00; carload lots, $10.75. San Francisco: $14.15. Mill copper plates, $17.15; bars, 24@18c. London: £48 per ton.

LEAD.—New York, $4.00; Salt Lake City, $3.50; St. Louis, $4.00; San Francisco $4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £10 16s 3d per ton = 2.26 cents per lb.

SPELTER. — New York, $4.30; St. Louis, $3.90; London, £16 15s per ton; San Francisco, ton lots, 5c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

IRON.—Pittsburg, Bessemer pig, $16.00; gray forge, $15.00; San Francisco, bar, 2.60c per lb., 2.65c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $27.00; open hearth billets, $29.50; San Francisco, bar, 7c to 12c per lb.

TIN.—New York, pig, $23.50; San Francisco, ton lots, 26c; 1000 lbs., 26¼c; 500 lbs., 26½c; 200 lbs., 26½c; less, 27c; bar tin, per lb, 30c.

PLATINUM.—San Francisco, crude, $19 per oz.; New York, $20.50 per Troy oz

BISMUTH.—New York, per lb., Subnitrate, $1.50; San Francisco, $2.50 to $2.75 lots.

QUICKSILVER.—New York, $51.00 large lots; London, £8 17s 6d; San Francisco, local, $48.00 per flask of 76½ lbs.; Export, $45.00

MAGNESIUM.—New York, $2.90 per lb.; San Francisco, $3.75.

ZINC.—San Francisco, 5½c; slab, 5¾c; bar, 7c; zinc dust, N. Y., 6c.

BABBITT METAL.—San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER.—Half-and-half, 100-lb. lots, 17c; San Francisco, Plumbers', 100-lb. lots, 14.25c.

NICKEL.—New York, 50@60c per lb.

FERRO-MANGANESE. — Pittsburg, 80%, domestic, $53.50, large lots.

TUNGSTEN.—New York, per lb., 95c; San Francisco, $1.15.

FERRO-TUNGSTEN. — New York, 37%, 32c; San Francisco, 65c (60%).

ASSAY LITHARGE.—San Francisco, 10c per lb, small lots.

POWDER.—F. o. b. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c per set; 14 oz., 40s., 9c.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

CURTAIN HOLDER AND POLE RING.—No. 691,155. Jan. 14, 1902. Emil Marsky, San Jose, Cal. This device is designed for convenient attachment of curtains and draperies of any description to the rings and the rings to poles or rods upon which they may be slidable. Each holder consists of a strip of spring metal bent into a curvature to surround a rod or pole and having intersecting notches at the point where the two ends cross each other. These notches may be interlocked to form the ring, and the parts which extend beyond are then given a reverse curve, so that the ends will close together by the spring of the part encircling the pole. The meeting ends thus closed together may be serrated or otherwise formed so as to grasp and hold the curtain or drapery. To disengage them it is only necessary to slip the interlocking notches away from each other sidewise, and the entire rings can be enclosed and removed from the pole.

NOTICE TO ENGINEERS.

Send $1.00 for complete instructions how to erect and start up a compound condensing Corliss engine; how to set the valves on all sizes of engines; rule for finding M. E. P. without the indicator; changing engine speed; setting eccentrics, etc

W. H. LA PEARLE, Salt Lake City, Utah.

Recently Declared Mining Dividends.

Gold Coin Mines Con., Colorado, monthly, $30,000	Jan. 25
Consolidated Mines, Colorado, monthly, $19,000	Jan. 25
New Zealand Con. M. Co., Colorado, monthly, $7650	Jan. 25
Gwin Mine Dev. Co., California, 5 cents per share, $5000	Jan. 21

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING JANUARY 14, 1902.

691,229.—TELEPHONE—Andriano & Herhstritt, S. F.
691,244.—POURING METAL INTO MOLDS.—J. V. Coleman, S. F.
691,127.—PENCIL SHARPENER—A. T. Fox, Tacoma, Wash.
691,311.—LIFE PRESERVER—C. Gore, S. F.
691,146.—LEVEL AND PLUMB—J. V. Janin, Seattle, Wash.
691,270.—WATER BANDAGE—C. H. Jones, Tempe, Ariz.
691,061.—JACK SCREW—G. L. & S. W. M. Kollock, Seattle, Wash.
691,277.—POSTAGE STAMP CARRIER—J. H. Lasserot, Berkeley, Cal.
691,155.—CURTAIN HOLDER—E. Marsky, San Jose, Cal.
691,163.—PULVERIZER—W. F. McClellan, Seattle, Wash.
691,175.—CAR AXLE BOX—J. L. Petithomme, Oakland, Cal.
691,077.—BUTT HINGE—F. W. L. Schafer, Los Banos, Cal.
691,013.—MENUGRAPH—W. H. Smyth, Berkeley, Cal.
691,015.—HARNESS SADDLE—E. A. Spaulding, Phœnix, Ariz.

To Hydraulic Gold Miners.

Well prospected gravel mine in ATLIN DISTRICT, British Columbia, containing One Million to One Million and a Half, can be controlled and equipped for FIFTY THOUSAND DOLLARS. Full reports and maps. References exchanged.

J. H. BROWNLEE,
Civil Engineer and Surveyor,
319 BOURNE AVE., SEATTLE, WASH.

SITUATIONS WANTED.

WANTED.—Position ae Superintendent of a quartz mine. Have had years of experience. Can do anything about a mine or mill. Am holding position as mine superintendent at present. No objection to South Africa, Korea, or Mexico. References given. Address L. W., care of this office.

WANTED.—Position as Assayer and Milliman by a practical man Am a practical miner. Understands cyanide work and mine accounting. Competent to act as assistant superintendent. Can handle men. No objection to Mexico or British Columbia. Address XZ, care of this office.

WANTED.—SITUATION IN MEXICO OR South America by experienced cyanide operator who speaks Spanish, is skilled in assaying, surveying, sampling, examinations, etc., and is practical. Address L. J. B., this office.

MINING ENGINEER, practical miner and mill man, assayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best references. Now working in southern California. Address A. M. P., care of Mining and Scientific Press.

WANTED.

Two Mechanical Draughtsmen Wanted for Northern Part of Mexico.

State experience and salary expected. Address C. C, care of Mining and Scientific Press.

WANTED.
A Free Milling Gold Proposition.

One with a well-defined vein, either a prospect or partially developed mine. State price, terms, location, and full description. Only owners dealt with; no brokers recognized. Address Box 3452, Boston, Mass.

THE CALIFORNIA DEBRIS COMMISSION, having received applications to mine by the hydraulic process from J. C. Murphy, in the Hidden Treasure Hydraulic Mine, at Kelsey, El Dorado Co., to deposit tailings in Kelsey Canon; from John Pascoe and W. H. Secombe, in the Chili Ravine Gravel Mine, near Placerville, El Dorado Co., to deposit tailings in Chili Ravine; from Warren T. Russell, in the Happy Flat Placer Mine, at Garden Valley, El Dorado Co., to deposit tailings in Happy Flat Creek; and from Wentz Bros., in their mine, near Pleasant Valley, El Dorado Co., to deposit tailings on a flat below the mine, gives notice that a meeting will be held at Room 59, Flood building, San Francisco, Cal., on February 3, 1902, at 1:30 P. M.

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CALIFORNIA STATE

MINING AND SCIENTIFIC PRESS.

Whole No. 2167.—VOLUME LXXXIV. Number 5. SAN FRANCISCO, SATURDAY, FEBRUARY 1, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Quartz Mining in the Klondike.

With increasing frequency reports from Dawson, Yukon Territory, discuss the development of a commercial quartz mining industry in the placer gold region of the Klondike. The first quartz mill, it is declared, started crushing in Novemher last and a second one a few weeks since. The capacity of hoth, it is stated, is exceeded hy the quartz offered for crushing. The winter cold is not permitted to interfere with operation.

The hints as to the charges for crushing indicate an exceedingly high grade of ore heing mined. One mill is offering to crush quartz for half of the gold recovered. To pay Klondike mining costs and transportation costs from the mines to the mill from one-half only of the gold in the ore, and have anything left, implies very rich ore. This is an incident, however, of the beginning of development of an industry novel to the country. Once the miners are sure of their mines, mills will multiply and grow like the vegetation in the short summer of that northern land.

The development of quartz mining in the Klondike has more than a local significance. It is the beginning of an industry that will populate and make rich and prosperous not alone the British Yukon, hut much of the vast interior and Arctic coast country of Alaska. It has taken some years to convince people that the Klondike had a resource in quartz mines that would long outlive the exhaustion of the placer mines. Gold-hearing quartz veins were discovered early, hut the comparison with the adjacent much easier exploited placers put them at a commercial disadvantage. With placer mining now well estahlished, and with its end in many localities measurable as not many years distant, the quartz veins are now receiving the exploration which is, it seems, more than realizing anticipations.

The Klondike has no monopoly of quartz mines associated with placers. The other placer mining districts of the north land have their quartz vein system also. In many they are yet to be discovered. In others they are simply located prospects with no actual work of development. This is the heginning that the industry must pass through. First, it will be declared there can he no quartz mines since there are none. Next, opinion is positive that there can he no quartz mines since the veins found are only prospects. Finally, some one actually gets gold in paying quantities out of one or more of the prospects, and opinion yields to the accomplished. The gold quartz mining industry of the Klondike is like the first swallow, which, while it does not make spring, nevertheless indicates that it is coming.

Gold quartz mines in interior Alaska mean roads, railroads, towns and cities, commerce and manufacture, the opening of coal mines and the huilding of great water power plants—all of which it will support. The country is too distant and isolated for it to remain entirely dependent on Canada and the States. It will have to build much for itself and become measurahly self-supporting. Gold quartz mining will provide a permanent basis for this as nothing else will. Ultimately with the multiplication of these facilities that entrain after it, the cost conditions of quartz mining will become equalized downward till they hecome ahout the same as in lands now regarded as more favored.

It is with much interest that this journal records the advance of quartz mining in the far inland north. It firmly estahlishes the existence of a vast storehouse of wealth which can become the suhstantial hasis of investment for surplus capital, and furnish the industrial life-hlood not alone for itself, hut for the producing and manufacturing industries of this older country. It will make a new permanent field for its surplus population and surplus production. .

Pride of the West Mill and Smelter, Washington, Santa Cruz County, Arizona.—(See Page 64)

Liberal Mine, Near Hailey, Idaho.—(See Page 60.)

CHROME IRON ORE deposits in California are hecoming profitahly workahle in a small way to supply the demand for a new service. The mineral is highly infusihle and resistant to corrosion hy melted metals and furnace slags. Its new use is as the furnace hearth lining of copper matte smelters. The California chrome iron which carries hetween 40% and 50% of chrome acid is found to be well adapted to this service, for which ore containing as low as 40% of acid is availahle. Where deposits are located close to railroad lines the mining of the chrome iron affords a fair margin of profit. The husiness should increase, as the adaptability of the ore for this purpose has only lately hecome known and hut few smelters have hegun to make use of it yet. For the manufacture of ferro-chromium the California ore is considered too low in chromic acid percentage by the manufacturers in Pennsylvania who import for that purpose the Turkish ores which run over 50% in chromic acid. The same ohjection has been made to the use of the California mineral for the manufacture of chromium salts and pigments. Considerable had been done in the way of development and commercial production in California in former years, and there is some promise of permanence in the industry.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 4 50

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

San Francisco, February 1, 1902.

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The Handling of Explosives.

Familiarity with high explosives develops a tendency to carelessness in their handling, which is the cause of many avoidable accidents. The manufacturers of dynamite are doing what they can toward producing an article that will be "fool proof" against reckless handling. They have not succeeded yet in accomplishing it. There is no real knowledge of the cause of many spontaneous explosions where every precaution that experience could suggest had been taken to protect against the possibility. Nevertheless these precautions should always be taken and the neglect of them by miners or subordinate employes should be cause for the peremptory discharge of the offender. The storage of stock supplies of dynamite should always be in a structure or magazine at a considerable distance from places where people congregate at work or in moving about. The temperature conditions should be as near constant as can be obtained all the year around. It is better that the powder be kept continually above freezing temperature, or continually below it, rather than alternately frozen and thawed. The latter produces changes in the mixture that free nitro-glycerine from the absorbent and thus increase the risk of handling. At a mine a disused adit, not connected with the mine workings, if dry, makes an excellent storehouse. Blasting caps and fuse should under no circumstances be stored with dynamite. The presence of the fuse is not an element of danger by itself, but it leads to the bringing into the magazine of the blasting caps, which are very dangerous. Powder from the magazine in transit to the point of use should be always handled by the same man or crew. The preparation of the fuse for blasting should be at a point where there is no dynamite even temporarily. The thawing of frozen powder is probably, more than anything else, the cause of accidents. No way of thawing is absolutely safe. Some methods are positively dangerous. Experience has shown the least risk to be by a not too rapid thawing by dry heat, not exceeding 130° F. The vessel used in thawing should be washed and dried after each using. The best grades of fuse and strong blasting caps should invariably be used. Lots of fuse found with defective lengths, and lots of caps, some of which miss exploding, should be discarded and destroyed. Better to lose their cost than to risk accident from their use. The same consideration applies to powder. There should be no hesitation about discarding lots of powder that are uncertain in action. There should be no missfires to investigate. When defective explosives are discarded they should be immediately destroyed. Burn them up under such conditions that if they unexpectedly explode they can do no damage. Some risk is inevitable where dynamite is used, but the rule should be no avoidable risk taken under any circumstances.

Facilities for Mines.

One of the old-time mining men, after listening to a promoter's glowing description of how the mining property he was offering possessed all the facilities, cheap transportation, good climate, fuel and water, turned it down with the comment that if the property had all the facilities described, it could not be a good mine. The old-time mining man said he had always observed that the good mines were always in some inaccessible place, with no kind of a climate at all, and were always short of fuel or water, or of both.

While all good mines are not necessarily where there are no facilities, or indifferent natural provision of them, there are perhaps enough of such good mines so situated to justify the generalization. It is notable also that capital is rather inclined, if its investments can be considered to indicate inclination, to take up the mines that are short on facilities. Instinctively a mining proposition that looks easy is overlooked for one that has difficulties. In some undefined way the overcoming of difficulties in the exploitation of a mine is associated with the idea of larger speculation in it.

The climate of the country where a mine is discovered has to be taken as ready made by nature. In some districts, notably in Colorado, the change from the independent operation of individual mines by shaft openings on the high mountains or slopes, to the joint operation of several mines through a common tunnel outlet into the valleys at the lowest possible elevation has improved the climatic conditions. Differences of climate made by differences of elevation of from 1000 to 2000 feet do make differences in the cost of mine operation. The removal of the base of mine operations from a mountain summit to its base improves the climate and lessens the cost imposed by the climate, independent of all the other improvements in facilities and lessening of costs that it brings.

Cheap transportation is a facility for mine operation that is only exceptionally provided ready made by nature. A partial compensation for this is found in the fact that the discoverers and operators of mines rarely have to provide the facilities for transportation themselves. Where there are good mines found, trails, roads and railroads are built in succession on the expection of sharing in the division of the profit of the mining. The exception is where the mining is a monopoly. Outside capital does not build transportation facilities for mines the operation of which is a monopoly.

Fuel—which means power—and water supply are two facilities in obtaining which the common practice has been for each mining operation to provide for itself. The last half dozen years' indications of a change in the practice, so far as fuel, or power supply, is required, are appearing. The economy of large units of power supply over small ones, and the simplicity of the distant distribution of power afforded by electric transmission, have made the joint provision of power in one undertaking for several mining operations commercially profitable. It is being undertaken more extensively as its economic advantages become more appreciated. In the long run it means lower costs of mine working. The water supply of nearly every mining district has natural limits which lead to its early monopoly. Perhaps more than any other facility, the lack of it makes exploitation of mines impossible, deters it, or limits it. It is notable that many districts in which the showing of value in mines is excellent remain undeveloped indefinitely, solely because there is no available water supply for exploitation. Of all the facilities essential for successful mining, it is so far the one which has received the least development from joint action. It is the one at this time from the development of which the most is to be gained for the mining industry as a whole.

There seems to be no valid reason why the mine operators of a district cannot unite to jointly provide all the facilities for the operation of their mines. They are already directly or indirectly so uniting in some districts to provide some of the facilities. The advantage of a common system of drainage for mines that can be drained by one system is so obvious that union for this purpose is quite common. Union for the joint provision of power and the joint provision of water supply are just as advantageous, though the special local problem to be solved are undoubtedly more difficult. As the mining industry is now carried on, the point of economic efficiency, or the lowest possible cost of metal production is only obtained when all the conditions are measured out into costs, and the separate facilities so balanced that their separate costs charged against mine production added make the lowest of several possible sums. For example, it may be that it makes a lower cost charge against mine production to build a railroad to take ore to a source of water supply than to build a pipe line and pump the water to the mine. In individual mining operations such problems are or should be worked out in advance of construction. They can just as well be worked out for a mining district in advance. The cost of common facilities divided among several mining operations is less to each than the same facilities provided separately for each. Again, they may be possible for all jointly and be prohibitive for each separately.

The most advanced problems of mining engineering are now those which deal with the districts of mines as units rather than with the single mines as the units. They are well worth even tentative discussion. A common waste is just as undesirable and just as much to be avoided as an individual waste. There are substantial advantages gained from individual ownership and operation of individual mines which are lost when mine consolidations are made. The only possible gain by consolidation is a lessening of the cost of facilities that comes from making the unit larger. The purpose of this article is to suggest that mine owners and operators can retain the advantages of individual ownership and operation, and gain those of consolidation, by combining without consolidating to supply the facilities which in greater or less degree all must have.

THE town of Havilah, Kern Co., Cal., one of the oldest mining settlements in the State, is threatened with being wiped off the map by the National Government. The reasons stated are its location within the boundaries of a forest reservation and the neglect of the inhabitants to take a town-site patent to the land. There is an inconsistency here which makes what appears to be an injustice. In the first place, the forest reservations are created by the executive action of the President designating the boundaries. Within some legal limits the President is given the power to modify the boundaries. Existing mining claims and existing grant and agricultural claims are not included in the reservation except through reversion, and there is a question as to reversion with mining claims. Town settlement, however, as an occupancy does not acquire any rights by prescription, and it is not a grant right that an individual by any procedure provided by law could initiate. Only a community has a procedure provided for initiating a grant that would be a vested right. The action of the community must be voluntary. It cannot be made adversely to a claim of mining grant or even to an agricultural claim. The limitations of its initiation are exceedingly narrow. The statutes of prescription have many years since established vested individual possessory rights. The facts will undoubtedly show that when Havilah was first established the public land survey did not include its site, so that no town-site claim could have been made; also that through the early years the site of Havilah was appropriated in mining claims and worked profitably for gold. A town-site claim could not have been made. Doubtless it will show that, even though the mining claims were largely worked out, they have been maintained to an extent that would prevent a town-site claim being lawfully made. The position of the inhabitants of Havilah hardly seems to be due to the neglect of doing something the law makes impossible. The fact that they have no vested title is due to the defect of the law. It hardly seems possible that a court of equity can sustain the Government in wiping the town of Havilah off of the map simply because it is little. It is an injustice that its inhabitants should be at the cost of fighting the attempt.

THE proposed legislation by Congress, to amend the law of mining location in Alaska by making placer mining location by agent or power of attorney void, should go further and make lode locations by agent and power of attorney in Alaska void.

Concentrates.

TONOPAH, Nevada, is situated at an elevation of 6300 feet.

AN electric current can be used to free water of some impurities.

GRAPHITE, or plumbago, is found with gold and silver ores in California and other States.

A METRIC TON is 2204.6 avoirdupois pounds. An English long ton is 2240 avoirdupois pounds.

MANAGEMENT is about 50% of any enterprise, whether it be running a wheelbarrow, a mint, a shop or anything else.

WOOD may be made flexible and non-inflammable by coating it by immersion in a 6% solution of caustic potash or a 5% solution of caustic soda.

FIGURES have been compiled showing that the reduction of copper ores into matte with hot blast can be done at $1.64 per ton. The Granby Smelter, B. C., states it is reducing copper ores to matte at $1.90 per ton.

LONG plumb lines used in transferring connection with surface survey lines into deep shafts are made of fine piano wire. To steady them very heavy plumb bobs are used, which are immersed at the bottom in buckets of water, oil or molasses. The latter is perhaps preferable, owing to its low viscosity.

THE bullion obtained from retorting amalgam should be melted down into a bar at the mine, but the quantity obtained from the average sized stamp milling operation does not justify parting or refining at the mine. It will cost more done at the mine than to have it done at a refinery where it is made a regular business.

IN a Sterling boiler the water should be carried as low as possible on account of the back drum and steam delivery. The amount of water carried on top of the tubes in a horizontal boiler should be about 3 inches on the front end, and, if the boiler is set properly, about 1 inch lower in the back end. Generally a lime water will not foam.

A NOTICE OF LOCATION of placer claim should declare the valuable mineral discovery made or sought to be made. If it is made for oil or gas it should so state. The other provisions of the statute being fully complied with, the courts might hold that the declaration was not essential to the validity of the location. A statement of the fact, however, avoids the possibility of having to refer the question to the courts.

THE decisions of the courts have tended to limit very materially what were supposed to be the broad rights granted tunnel site location claims. The privilege of making such tunnel claim locations is of doubtful value. If possible it is preferable to accomplish the same purpose by making lode claim locations covering the unoccupied surface in the line of the projected tunnel and then use the tunnel construction as the assessment work for all of the claims.

THE tunnel law of Colorado has not been declared unconstitutional by a court of last resort. In respect to its conferring the right on the tunnel owner to drive his tunnel through the claim of another without the latter's consent, a hearing on injunction in the case of the Seaton M. & M. Co. vs. the Tropic M. Co., at Georgetown, Colo., indicated that the courts would decide that it was unconstitutional. The case was withdrawn by the consent being obtained.

THE mining law of Yukon District, Canada, allows a miner the right to stake or claim only one placer claim on each stream or tributary of a stream. The Gold Commissioner at Dawson has decided that the distinction between streams and tributaries must be strictly observed. The decision disallowed the second claims of a number of miners on Conglomerate creek who undertook to get them by giving the upper portion of creek another name, as if it was a real tributary.

"CONCENTRATES" is not able to give individual advice as to mining investments. An honest endeavor is weekly made to give correct technical answers to the multitude of questions received, but it is manifestly without the province of this paper to answer either on this page or by mail any inquiries as to the value or lack of value of any special mine investment. The news is weekly given elsewhere, and special effort is made to have it right, but to pass upon the merits or demerits of specified mine investments would not be practicable.

IN the case of the Cosmopolitan M. Co. vs. Foote et al. (101 Fed. Rep., U. S., 518) it was decided that where by mistake a mining claim was located across, instead of along, the vein passing through the location point, the rights of the locator were governed by the facts as they exist with regard to such vein. His side lines, as located, in that case became end lines, and he is not entitled to any extralateral rights thereunder, although another vein, extending transversely to the one intended to be located, may have apex itself inside of such surface lines.

THE temperature of steam in contact with water depends upon the pressure under which it is generated. At the ordinary atmospheric pressure (14.7 pounds per square inch) its temperature is 212° F. As the pressure is increased, as by the steam being generated in a closed vessel, its temperature and that of the water in its presence increase. Saturated steam is steam of the temperature due to its pressure—not superheated. Superheated steam is steam heated to a temperature above that due to its pressure. Dry steam is steam which contains no moisture. It may be either saturated or superheated. Wet steam is steam containing intermingled moisture, mist or spray. It has the same temperature as dry saturated steam of the same pressure.

TO temper or harden steel it is cooled or chilled rapidly from a temperature of over 1000° F. If the metal is desired soft it is heated to the same high degree of temperature as above and is then cooled very slowly. With brass the processes are reversed. Quick cooling of the heated brass produces a soft malleable metal. To make brass hard, and to give it temper, it must be reheated and then cooled very slowly. It is by this slow cooling that the Chinese prepare the metal of which they make their gongs.

JADE is the common name of a gem stone, or rather rock, which may be one of two minerals distinct in composition. One variety is a silicate of sodium and aluminium called jadeite, corresponding to spodumene, in which the lithium is replaced entirely by sodium. The other variety is a magnesia lime silicate in mineralogy nephrite. The color ranges from almost white to dark green. The stone is hard, tough, breaks with a splintery fracture, and takes a high polish. It is not very common. The discovery in California cannot be considered unusual. It occurs with amphibole and serpentine, both very common formations in California.

ASSAYERS' RETURNS on mill or treatment tests should always be reduced to the original ton unit of ore under examination. This is frequently overlooked and if not understood can be the cause of incorrect deductions from the figures. For example, the assay figures of the final trials where a percentage of concentrates has been taken out in the test assay higher per ton than the real figures of loss per ton on the original ore. The difference is quite important where the percentages of concentrates run very high. Some assayers get into the habit of depending on duplicate assays for the check on the accuracy of their assay work and omit the check on the sampling work which is made by reducing the value and metal quantity figures to the base of the original ton of ore.

FAILURE of a co-owner in a mining location to contribute his proportion of the assessment work creates a forfeiture, after the advertisement of the failure, as provided by the statute, and after neglect by the defaulting co-owner to pay his proportion and costs within ninety days after the publication of notice to pay is completed. The forfeiture is to the other co-owners who do pay and title is vested in them by the operation of the statute. If an outside party, not a co-owner, pays the defaulter's share and costs of publication under an agreement to have the defaulter's share in the event of the latter's failure to redeem, he can only get title by deed from the other co-owners. The deed is best made after the expiration of the ninety-day period during which redemption could be made.

HYDRAULIC rams have not been the subject of close analysis as to efficiencies. There is little information of actual working tests published. Exact uniformity of conditions for comparison has been seldom made, and if made, still more infrequently published. A good hydraulic ram should give over 70% efficiency. A very good one will give over 80% efficiency. Some figures have been published showing efficiences over 90%, but are doubtful. In estimating efficiency allowance should be made for the friction head of the pipes. To get high efficiency use good perfect-seating valves and clean smooth pipes. It is no disadvantage to have the delivery pipe of slightly larger diameter than the makers advise, particularly where the length is considerable. An increase of water delivery is obtained by using two or more rams tandem.

REVERBERATORY smelting of lead ore consists of a combined roasting and reaction process in which the two operations are repeated one after the other. In hearth smelting these two operations, which also constitute the process, are not consecutive but simultaneous, roasting and reduction going on at the same time. In the reverberatory furnace lead is reduced from the ore by the interaction of the unaltered galena, that is, the sulphide, with the sulphate and oxide; in the hearth furnace there is additional reduction from the lead oxide by carbon. The reverberatory is worked without a blast, the hearth with one. In the latter furnace the ore and fuel do not rest upon a solid bed, but upon a bath of molten lead. The charge in the hearth furnace is never fused, but at intervals the blast is stopped, a portion of the charge removed, the poor slag separated from it, and after cooling and an admixture of lime to stiffen it, the charge portion is returned to the furnace.

STAMP MILLS or other crushing machinery are used in working some California placer mines because the gravel containing the gold has become so hard and cemented that washing alone will not break it apart and free the gold. The cementing material is in some mines silica or lime; in others it is ferrous oxide and in still others pyrite. The ferrous oxide is the result of the oxidization of pyrite by a continuous submerging flow of surface waters. It gives the characteristic color to "blue gravel." Where the flow of surface waters is intermittent, and its place taken in the intervals by the atmosphere, the oxidization is carried further and ferric oxide results, which is only lightly, if at all, cementing on the gravel mass. This oxidization makes the red gravel. Pyritic cementation almost certainly is produced by uprising sub-surface waters, and silica and lime cementation most probably by surface waters. Generally the cementation is only partially complete, making an agglomerate rather than a conglomerate, the distinction being that the first disintegrates into its original constituent particles and masses, and the latter does not, the cementation being complete, making the mass of equal hardness throughout. Some of the cemented gravels require quite fine crushing to free the gold, others only a stirring or tearing apart under water.

IN ordering or designing hoisting engines it is absolutely necessary that the exact meaning of the word "load" shall be thoroughly understood by both maker and buyer. It is accordingly becoming the custom to have all the details described and so stated that they can not only be understood, but that they can not be misunderstood. The amount of ore raised may be called the net load, and the weight of ore, cage and rope the total load. In the case of flat rope hoisting in a deep shaft, the weight of the rope may be greater than the remainder of the total load. So that the weight of the rope has manifestly great influence in determining the size of the hoisting engine to be employed. Where hoisting is done with the weight of certain parts of the total load counterbalancing the weight of others, the hoisting is in balance. The remaining weight is unbalanced load, and is that which the engine must lift; but the strength of the various parts, such as clutches, shaft, etc., must be proportioned to stand the total load.

THE first process in refining petroleum is selective distillation, during which the petroleum is passed through various stills at different temperatures, the temperature of the petroleum being increased at intervals during the process. At the lowest temperature gases are given off, which remain as such at the ordinary temperatures of the atmosphere. Then, as the temperature is increased, petroleum, ether, benzine, C naphtha, B naphtha, A naphtha, illuminating oil (kerosene), lubricating oils, paraffine wax, tar and coke come off in the order named. They are the so-called naphthas that are of special interest to the gasoline engine user. C naphtha ranging in density from 80° to 68° Baume, is that which is used on a gasoline engine, the common densities for the purpose being 76° to 74°, the latter being known as stove gasoline. Each of these petroleum products may be further subdivided by selective distillation, into substances having different densities. In fact, the ordinary gasoline of commerce is in reality a mixture of various hydrocarbons of different densities, the average density of the mixture being that at which the gasoline is rated. It is this circumstance that is the cause of nearly all the troubles with carhureters, as it is the tendency of the lighter products contained in the mixture to evaporate before the heavier products.

AT the Minnesota iron mine, Tower, Minn., as first mined, the ore comes out in huge chunks of nearly the hardness of steel, expensive to handle, both at the mine and during transit to the furnace, and requires more fuel to smelt than ore in moderate-sized pieces. Huge crushers were erected near the shaft-houses and the ore trammed directly to them. Ponderous iron jaws, weighing ten tons each, crush it to pieces that will pass a 4-inch aperture, after which it is dumped on the stock piles. Previous to this, during the shipping season, it took several hundred men, using shovel and barrow, to load the ore into cars. One immense steam shovel, with six or eight men, now does the same work, making a record in keeping with the improvements elsewhere about the mine. Its dipper holds 3½ tons, and, when working steadily, fills a 25-ton car in two minutes. It has loaded 192 cars in a day of fourteen hours, approximately 4800 gross tons. Another improvement which has greatly reduced the cost of mining is the substitution of machine drills, driven by compressed air, for the hammer and drill in the hands of the old-timer. There are now employed 600 men, who get out nearly the same amount of ore as ten years ago, with a daily average of more than two tons per man, and at a cost of less than $1 a ton.

A VOLUMETRIC DETERMINATION of copper by potassium cyanide solution is as follows: Dissolve 10 grammes of potassium cyanide in 250 cc. of water and mix thoroughly. Weigh 2 grammes of pure copper wire, transfer to a one-fourth liter flask, add 25 cc. nitric acid and warm gently until the copper is all dissolved; boil to expel oxides of nitrogen; cool, dilute with water to the mark and mix well. Take 50 cc. of this copper solution, transfer to a No. 3 beaker, add ammonium hydroxide until the precipitate formed dissolves and the solution is alkaline. Fill a 50 cc. burette with the potassium cyanide solution, and gradually drop the cyanide solution into the copper solution until the blue color disappears and the solution becomes colorless. Note the number of cubic centimeters of potassium cyanide solution required to do this, and mark upon the potassium cyanide bottle the value of 1 cc. in terms of copper. Thus: Suppose 50 cc. of the copper solution required 31.3 cc. of potassium cyanide solution, then 31.3 cc. KCN = 0.40 gramme Cu and 1 cc. KCN = 0.0127 gramme Cu. Having thus obtained the value of the potassium cyanide solution, it can be used for determining percentages of copper in alloys, bronzes, etc. For example, brass: Two grammes of brass are weighed out and treated with 25 cc. nitric acid, and the solution made up to 250 cc; 50 cc. of this solution are made alkaline with ammonium hydroxide and titrated with the potassium cyanide solution. Having determined the number of cubic centimeters of potassium cyanide solution required to decolorize the 50 cc. of the brass solution, the percentage of copper is calculated from the above data.

Treatment of Refractory Silver and Gold Ores at the Mine.

Written for the MINING AND SCIENTIFIC PRESS by R. C. CAMPBELL-JOHNSON, M. I. M. M.

British Columbia has a problem to solve of such importance that its satisfactory solution means the difference between life and death to her silver mining industry.

The fact is that nature has been bounteous in placing immense mineral wealth in her mountains, this mineral not necessarily more phenomenally rich than that in other lands, but in endless quantity. Having this natural advantage, how is British Columbia to transmute this mineral, when wrought so cheaply, into marketable metals that they may compete with profit in the world's great emporium?

There are other interests which try to make a living out of the mining industry, and which go further, taking the cream off the profits, though their share of the risks and work is a very secondary part. Transportation interests and smelting works are the interests referred to, against which mine owners at present have to contend. It is no illusion to believe that British Columbia in the near future, if successful in solving this trade problem, will regulate the price of silver and lead to the world from her abundant store.

Let us take and examine a map of the North American continent showing the mountain chains. Mexico has mountains, but less than those in the United States. British Columbia, however, has all the ranges between Colorado and the Pacific, which have been and are producing such untold riches, converged into her territory for 800 miles north and south, and for 400 miles east and west, covering 390,000 square miles, all of it mineralized with some metal of commercial value. This mineralization is no fairy tale, but a fact proved by the work of the hardy prospectors.

The transportation companies of Canada are wisely made subservient to the dictates of the Government as to rates when bonused by the people's money. Smelter trusts fail if the mine owners can produce marketable metals without their aid. In showing how British Columbia is to avoid dependence on these interests, the writer remembers that there are other mining districts in other lands that have the same problem, and that perhaps an account of her means will be of interest to miners in these districts.

As an universal treatment for all ores indiscriminately is an impossibility, and since modifications for each individual ore have to be introduced as found necessary by the metallurgist in charge, we must describe the character of the ores in British Columbia which we propose to enrich by mechanical means first. They are known as dry and wet ores, sometimes carrying both the precious metals—gold and silver—and sometimes only one. By a wet ore is meant one that in its composition contains over 10% of lead, probably also zinc, with small proportions of antimony, copper or iron, each combined with sulphur. By a dry ore is meant one that contains less than 10% of lead, or very little at all. In these ores the precious metals are partly alloyed with the base ones, and partly unalloyed in the form of native metals, or sulphides, as in argentite, ruby silver, etc. Chloride of silver is sometimes present. As all chemical treatments, whether by heat or solution, cost money, it is evident that the first stage must be to enrich the values by reducing the bulk. This is accomplished by mechanical concentration to eliminate valueless rock, but at the same time not to concentrate so closely as to throw away values with the discarded tailings.

In this class of silver-bearing ores experience has taught metallurgists that wet concentration, to save 95% of the values, is not effective on account of the silver slimes continuing in suspension in water. Therefore a system of dry concentration is a sine qua non. To crush large quantities dry there are many machines for sale—stamp mills, crushers, rolls, ball mills and many others. In choosing a mill there are two special conditions to be thought of besides rapidity—first, the loss of iron on the castings through wear and tear, which means cost per ton of ore ground in replacing parts and repairs, and, second, even more important, the size required for the material ground. Many machines grind the stuff to pass screens of eighty or more holes to the lineal inch, for our purpose unnecessarily fine, and giving more trouble in making a satisfactory separation in fines of value from waste. The most easily treated sizes are from thirty to sixty mesh, according to the needs of the ore being treated.

Having now crushed our ore with all the requisite contingencies carried out, as previous drying, if necessary, fans to draw off the dust, and the other complements known to the profession, the next stage is classification into sizes, dividing stuff of thirty mesh from forty, and so on, that specific gravity may have full play in separating good from waste.

There is an English-made machine which has a revolving hopper perforated around the lower end which stands vertically in a large iron, stationary, rounded basin. This basin has at intervals in height shelves riveted around the inside. Specific gravity throws the heavy material from the revolving hopper into the shelf farthest away, and the lighter material into those shelves nearer, making an excellent separation. Revolving brooms and hoes deliver the material from the shelves through holes on the outside into launders leading to bins. This simple machine makes wonderfully clean separation for sized material say larger than sixty mesh. To separate finer stuff again sized, we must use something of the "terra seca" pattern, as employed to separate gold from sand on the Arizona desert. These machines are inclined wire screens, onto which the fines fall from distributing feeders. There is an intermittent puff of air made to rise through the wire screens with force under control. This is an effective separation for the fines. Having now eliminated the bulk of our waste with loss of very little of the values, we have to treat the concentrated material and produce marketable metals.

A process commercially used on Broken Hill ore in Australia would seem to be available here. The plant is a species of bessemer converter, with mouth leading into a closed chamber. These metallurgists have discovered how, in a sulphide ore heated to a low temperature, chlorine gas will drive out the sulphur, taking its place and not combining with it; so in this converter heated by electrical poles, not by fuel, on the introduction of dry chlorine a chloride of zinc, lead, gold and silver is formed, leaving the silica (quartz) unacted upon.

Metallic zinc has greater affinity for chlorine than lead, gold and silver, and is, therefore, introduced in sufficient quantity to satisfy the chlorine present, forming chloride of zinc and molten metallic lead, carrying the gold and silver. The molten metal is now tapped off, refined and the metals sold separately, for acid can be produced from the sulphurous fumes.

The chloride of zinc is leached out, precipitated, reconverted into metallic zinc and free chlorine, as much of the zinc being used again in fresh charges as is required and for desilverizing the lead, and the balance is ready for market. A successful process to separate by electricity common salt into its component elements—free chlorine and free sodium—has been invented. Thus to treat silver and gold ores at the mine the only material to be transported is common salt, electricity carrying out all the rest of the process and working the machinery.

As British Columbia has abundant water powers from her creeks throughout the mountains, this complete process seems suitable to her ores, producing marketable metals as cheaply as elsewhere, if not cheaper.

We hope, therefore, to avoid dependence on the smelting trust here, to get more favorable transportation charges, and to justify our promise that British Columbia will regulate the price of silver and lead to the world.

The Liberal Gold Mine, Hailey, Idaho.*

Written for the MINING AND SCIENTIFIC PRESS by F. C. MANDELL.

The Liberal mine comprises thirty full claims, located on the gold belt, 27 miles west of Hailey, Blaine county, Idaho. The illustration herewith shows the mine buildings and environment.

Practically all the development has been made in the past eighteen months and consists of a crosscut adit 150 feet long to the lode, whence the vein has been drifted upon for 400 feet. From this tunnel an upraise 159 feet long follows the vein to the surface. There is also an incline shaft dipping 45°, sunk beneath and parallel with the vein, 100 feet deep, from the bottom of which the ore has been recently tapped by a crosscut.

The vein is quartz, having an average width of 8 feet, carrying, as far as developed, an auriferous iron pyrite. Values as high as $100 per ton are found, but the average value throughout the workings is between $8 and $9. A continuous shoot of ore is exposed along the 400 feet of drift and up the raise to the surface, as well as in the crosscut from the bottom of the incline 100 feet below. The ore is readily concentratable and ultimately some mode of concentration treatment will be adopted and a plant built. The strike is northwest and southeast and the dip is 45° to northeast. The country rock is an eruptive granite somewhat metamorphosed, locally, by a porphyry dyke, 25 feet wide, which forms the front wall. D. S. Richards is Supt. and F. R. Reed manager.

*See illustration on front page.

THE U. S. Geological Survey states the number of springs of mineral water on the list as utilized during 1900 is larger than for any previous year, the net increase over 1899 being twenty. Thirty-seven springs have been added and nineteen dropped, making a total number for 1900, 561 as against 541 for 1899. The number of springs actually reporting sales is 491, more by twelve than the number for 1899. The amount of waters sold in 1900 exceeds the record for 1899 by about 8,000,000 gallons, and shows a loss of about $700,000 in value. The price per gallon fell from 17.5 cents in 1899 to 12.5 in 1900.

The Homestake, S. D., Milling Process.

Written by a Former Mill Foreman.

As the ore is hoisted from the mine, it is dumped into Gates crushers, where it is broken the sizes of 3 inches or under. Large ore bins that have been excavated from the solid rock immediately under these crushers receive the broken ore, from which it is drawn through chutes into two-ton cars. These are drawn into the tops of the mills by steam locomotives (which are soon to be replaced by compressed air locomotives). The ore is brought in by trains of about twenty cars each. The mill bins, into which it is dumped, have a capacity of about 1700 tons, or forty-eight hours run. The bins being in the top of the mill, the ore passes through by gravity. Ore passes from the bins into automatic feeders that feed it into the stamp battery as required. The feeder is operated from one of the stamps which throws a little ore into the battery each time the stamp drops. These feeders are regulated and attended to by two men on each shift. There is one of these automatic feeders to each battery of five stamps. These stamps weigh from 800 to 950 pounds, the weight depending on the length of time the iron has worn. A stamp is composed of stem, tappet, hosshead and shoe. The shoe is a case-hardened casting weighing 150 pounds and has to be renewed every sixty days. The die in the bottom of the mortar that the ore is crushed on is renewed every forty days. The ore is crushed to pass through what is known as a No. 8 diagonal slot steel screen, equal to about 35-mesh. Mercury is fed into the battery every thirty minutes by a man who examines the outer plates to see the amount required, which depends, of course, on the richness of the ore. The usual amount at one feed is about a wooden mustard spoonfull. The mercury forms an amalgam with the fine particles of gold as they are freed from the encasing rock that encloses them. This amalgam has a great affinity for copper or silver. About twenty gallons of water per minute is discharged into each battery with the ore. This forms a thin pulp that passes out through the above mentioned screens, and in doing so, it passes over copper plates. The first one is inside the battery and immediately under the screen. It is 54x6 inches in size. After passing through the screen, it passes first over a plain copper plate 10 feet by 54 inches in size, then over 36 by 54 inches of silver-plated copper. The coarser and heavier amalgam is caught on the first plates, which is shown from the value of the amalgam. That caught on the inside plate is worth about $8 per troy ounce, while that recovered from the last 12 feet is only worth $1.50 per ounce. These outer plates are cleaned up every twenty-four hours with heavy whiskbrooms, always leaving a good coat of soft amalgam on them. When the amalgam is found to be a little too stiff, mercury is sprinkled on from a bottle with a piece of eight-ounce canvas tied over the mouth of it. It requires nearly $1000 worth of amalgam to put a new copper plate 12 feet by 54 inches in good working order.

The chuck block, as we call it, or the inside copper, is cleaned every fourteen days. The amalgam becomes very hard on this copper and has to be removed with steel scrapers. There are about 10,000 ounces of mercury used a month in one of these 200-stamp mills. Of this, there is lost about 10% by its being divided into such fine particles that it floats off in the tailings. The other is recovered when the amalgam is retorted and it is used again.

The amalgam is retorted every ten days and the resultant bullion is immediately taken in charge by the American Express Co. The tailings pass from the mill to the gig plant, where they are concentrated to save the sulphides that refuse to amalgamate. From there they are conducted to the cyanide plant.

The mills are the Golden Star, which has 200 stamps, Homestake 200, Amicus 140, Deadwood Terra 160, Caledonia 100, and the DeSmet with 100 stamps. These stamps crush a little over four tons each per twenty-four hours. They are lifted by a cam coming in contact with the tappet and drop of their own gravity eighty-eight times per minute. The 200-stamp mills are driven by 500 H. P. Corliss, compound, condensing engines. Steam is furnished by four upright tubular boilers that consume about fourteen tons of coal per day of twenty-four hours.

It has been found by repeated tests that the best temperature of water used for saving in the battery the greatest amount of amalgam is between 45° and 55° F. When the water becomes too warm the amalgam softens and is dragged off the plates by the action of the pulp. When the water is too cold amalgamation takes place too slowly.—Black Hills Mining Review.

IMPROVEMENTS in the efficiency of generators have been for some years a matter of little moment to the electrical designer. The electrical generator is the most efficient mechanism in the world. The loss of energy in it is only 2% or 3%, and if there were any special object in doing away with this slight loss it could easily be reduced to a fraction of 1%.

Driving Tunnels by Hand.

Written for the MINING AND SCIENTIFIC PRESS by J. H. SHOCKLEY, A. I. M. E.

Having driven hy hand in the past two years over 2 miles of tunnel in the mountains of San Juan, where the metalliferous bearing formation is principally an igneous rock, consisting of bedded tuffs, breccias and commingled agglomerate of andesitic materials, covering the greater portion of the mining districts in an immense sheet in which the principal mines are found to a maximum thickness of perhaps 6500 feet, it would seem that in this extensive and intensely mineralized area nearly all the features encountered in ordinary tunnel work might he found. Rocks so metamorphosed hy replacement as to he difficult to detect andesitic origin have been driven through. Their normal constituents have heen so indurated, so subhstituted with secondary siliceous matter, pyrites, etc., that they form close-grained rocks, hard to drill and which hreak in a most "short" and unsatisfactory way. On the other hand, faulted, fractured zones, carrying great water courses, filled with unctuous masses of oozing talcose material, large and small irregular boulders—attrition products necessarily formed in these profound lines of weakness in the crust of the earth, which, no douht, have more than once acted their part in the mountain building—have heen encountered and opened under conditions where skillful work is necessary to hold the ground and procure economical, rapid headway. All of the above conditions were found in the Turkey Creek tunnel in Watton Basin during the past year, yet an average headway of 125 feet per month was made. As a practical art, aye, almost a science, tunnelling is perhaps not so fully understood as it should be, and after an experience of nearly twenty years throughout North America, a few points thought to he of value may he suggested, to wit:

In hard, close-grained, tight ground, in single track hand-worked tunnels, keep your tunnel not less than 4½x7 feet, room enough for the ground to hreak and work double handed. Don't let the miners get too much ground on their holes therehy causing a lot of "guns" to he in constant evidence. If miners persist in reloading "guns" discharge them. Never let the breast "coop" in on you so that it looks concave, that is, don't gouge out the center. Keep the corners out, the hottom down, the roof up, and the sides straight, these are vital points. See that the shift going off leaves the hreast in good shape for the one going on, don't let one shift gouge on the other, for if a shift has to take up "hottoms," heighten the "roof" and widen out the sides it means material loss of headway, and neither will good miners do this very long for the other shift. Have a hlacksmith who is an expert with steel, as poor drills are an aggravation to the whole works, and give the men plenty of them; ⅞-inch steel is hest. Don't be stingy of powder in hard ground.

In medium, easy drilling ground, work two men in the hreast on a shift, single handed. You cannot do good work without good air; see that the men have it. Keep the track up close to the breast and give the muckers steel plates to shovel off of; see that the dirt from the hreast is turned hack on these after shooting; they must he laid down, of course, before shooting. As an average give the track a grade of 7½ inches in 100 feet, and see that the trackmen always use the grade sticks in laying the track. Cars that hold about a ton of rock are the hest. Make the muckers use the chain when dumping so that the car won't be going over the dump all the time. Use good hig ties, that will hold the spikes, and put them 30 inches apart for ordinary track. Keep the track up and clean. Don't let the dirt accumulate hehind the miners in the hreast; keep it trammed out so that you can see how things look and the men he ahle to judge about laying their track and putting in their holes. Mucking is the hardest work around that joh, so have enough muckers so that they can keep caught up. Remember, that they will handle more fine stuff in less time than if it is coarse: another good reason for plenty of powder.

In soft, caving ground, where close timhering is necessary, the drills can most often he done away with; then use the "hull stick;" a 42-inch or 48-inch pointed har of steel, 1⅛-inch at the hig end, with a head on it or a ring to get it out with after it is driven in. Using this is far hetter than drilling. And if the ground is quite stiff go at it douhle handed, that is that let one man pound the "hull stick" for a while with an eight-pound hammer, and then let his partner go at it, while the other is taking a hlow, as this work is very fatiguing at times. More often, however, in this character of ground one man can fill the hreast pretty well with holes during his one-half shift. A set of timhers a day should he put in 5 feet apart, mudsills, caps, posts, lagging and all. Don't give the ground a chance to cave and get away from you, hut keep the timhers well up to the hreast, and have the tunnel wide and high enough so that when you are ready for the set that you have not got to monkey around and cut a lot more ground before they will go in, and therehy keep one-half the gang doing nothing. Point the roof lagging a little up, so that in driving them they will he sure and land over the top of the next cap in front. In swelling ground have the lagging a little way apart, so that you can pick out the ground and relieve the pressure; also put in mudsills, for posts without sills will settle and conscquently cause endless trouhle.

Have long, light, well-handled picks without too much of a hook to them, and keep all tools in a perfect condition at all times. Often tunnels are driven on veins and in ground so constituted that holes will hreak no matter where they are put, hut frequently on veins there will he a small, soft streak, with the rest of the veiu very resistent; here use the "hull stick" in the soft streak, and cut it out ahead for several feet, say from 3 feet to 6 feet, then drop hack and with the drills, a long half upper with one or two down holes, will form the drift; especially if the vein pitches, which most always is the case. This cutting ahead process of course gives the other holes a fine show to hreak. The ahove points, coupled with a due appreciation of your men, should give good results, and while it is difficult to lay down a hard and fast set of rules for any kind of work similar to hand tunnelling, it will he found that the application of the ahove suggestions, as far as practicahle, will increase the average headway maintained in the ordinary tunnel.

Valuable Testimonials to Value.

A Silver Star, Mont., suhscriber writes: "I have the hest work on the cyanide process in existence. It consists of clippings on that suhject from your paper."

A Cripple Creek, Colo., mill man says: "I have learned more from the MINING AND SCIENTIFIC PRESS ahout concentration than from any other source."

A Prescott, Ariz., mine superintendent says: "Yours is emphatically the paper for the miner, and I always trust your advertisers. You have never yet fooled me with a fake advertiser, and I've heen taking your paper for twenty years."

A Deadwood, S. D., cyanider sends a list comprising forty-seven different expert articles on the cyanide process, and says: "Each one of those is in my scrap book, clipped from the MINING AND SCIENTIFIC PRESS, and I consider the collection of unequaled value anywhere."

A Grass Valley, Cal., reader writes: "I find more value in "Concentrates" than any other printed page received from any source. I consider the MINING AND SCIENTIFIC PRESS the best mining publication in existence, and I get ahout all there are."

A Kalgoorlie, Australia, suhscriher says: "When one copy of your paper is missed there is prompt complaint. We all look for it and think it the hest of all of them."

A Hailey, Idaho, suhscriher says: "Find enclosed $3 for renewal of suhscription. I part with this money with more satisfaction to myself than with any laid out for any other puhlication, and I take many of them."

A New York City mining engineer says: "Enclosed is $3 for another year's suhscription to the hest mining paper puhlished. It is worth $1000 a year to me."

A Nelson, B. C., suhscriher says: "Reliahility in your statements and in the advertisements you puhlish makes your paper respected in this section, where it has many friends."

From Chihuahua, Mexico, a writer asserts that "We all like the MINING AND SCIENTIFIC PRESS. It is not afraid to tell the truth and always gives information of great value to every miner."

One southern California subscriher makes an assertion that we have heard hefore, hut to which we are not prepared to implicitly assent. He says: "In this place when a witness is to be sworn in the justice court, in the ahsence of the Bihle we swear him on a copy of the MINING AND SCIENTIFIC PRESS." Still, the idea is all right.

"The original articles, 'written hy the men who do the things they talk ahout,' are to me of the utmost value. I learn a great deal from your paper and keep every issue," is what an Antofagasta, Chile, suhscriher writes.

"I read much of what you weekly print copied in other papers, hut like to read the advertisements of reliable concerns that you weekly puhlish," is the statement of a Nogales, Ariz., reader.

"There is a lot of things that I like about your paper—its truth, accuracy and scope—hut I helieve I hold in highest value the many original papers you puhlish, written for you hy practical mining men," is how a Cripple Creek, Colo., mine manager views it.

The ahove are from a large number of similar statements received during the first month of 1902, and are indicative of how our readers feel toward this journal."

IT is claimed that the hest luhricant to use on aluminum when turning it on a lathe is either petroleum or water, and when stamping it in the press or drawing it, vaseline.

The Rio Tinto, Spain, Mines.

R. E. Palmer, formerly of Rosslaud, B. C., and now assistant manager at the Rio Tinto copper mines in Spain, in a letter gives some details of the method of mining employed.

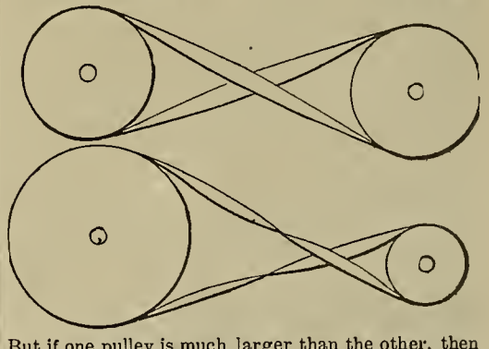
"This is such a huge place that it is difficult to describe," says Mr. Palmer. "This year we have moved a little over 2,000,000 tons of copper ore, hesides 700,000 to 800,000 cuhic meters (ahout 3,000,000 tons) of iron cap. We have a smelter and hessemerizing plant, hig copper washing tanks, sulphate of copper works, sulphuric acid works, two hig open quarries working, two hig underground mines, 60 miles of railroad from here to Huelva, hig loading piers, workshops, and so many other minor things that it would take hours to describe each. We employ 11,000 men and hoys, the average pay heing 15 reals per day, or 60 cents in gold. We have every kind of pyritic ore, from ore containing 50% sulphur and no copper to that containing varying sulphur and 20% copper. The mineral is in hig masses, lying in porphyry or hetween porphyry and slate, and covered hy 50 to 60 meters of iron cap, fairly well decomposed and soft. This is removed in terraces and henches hy locomotives, and the mineral is quarried down to a certain level. Below this limit the mineral is mined, and all this work is mine. This year I made a good record, raising 765,000 tons of ore through two shafts.

"The masses of mineral are enormous. One on which I am working is ahout 3000 feet long, never less than 50 feet wide, while at one point ahout 1000 feet down it is 660 feet wide of solid mineral. There is no hunting for ore—the question is economical extraction and classification, the latter an important item. Timher is very expensive, and although we use a great quantity our mining operations are conducted practically without it. The system of mining here is what is termed 'pillar and stall'—that is, every 12½ meters a floor or level is opened 4 meters high, and the whole floor divided into galleries and crosscuts 4x4 meters, leaving in place supporting columns 6 meters square, the extraction of ore heing provided by the openings. This is expensive work, the mineral heing very hard and tough, and the operations are practically of an explorative nature. One man, hand work, with a douhle-handed hammer, hreaks ahout one and one-fifth tons per shift, all on contract or piece work. Between the roofs of these galleries and the floors ahove were left, of course, 8½ meters of solid mineral.

"The Spaniards do a good day's work if put on a task, hut will do nothing hy day's lahor if they have no contract or task. It is next to starvation for a man if he is discharged, so we have control over the miners. They are more or less like children, and if they don't do their duty we fine them a couple of days' work or send them home for a week. We have to he very stern with them. We don't work the men on Sundays, and their tasks are generally done in eight or nine hours."

To Make Cross Belts Run Smoothly.

What are usually known as cross helts are very common in driving machinery, and it is a well-known fact that they run hest when the two pulleys which they connect are somewhere near one size. But sometimes it is necessary to use a cross helt on pulleys of very different diameters. This may he done and still have the helt run smoothly. If the helt connects two horizontal shafts on the same level, and is given the ordinary turn or twist, it will naturally stand in a vertical position at a point midway hetween the two shafts. Now, if the two pulleys are of one size, this midway point is the natural crossing place for the two parts of the helt and all goes well.



But if one pulley is much larger than the other, then the helt must cross at a point much nearer the small pulley than the larger one, and with the ordinary twist the two parts of the helt are apt to quarrel, so to speak, at this point. To remedy this, in many cases it is only necessary to give the two parts of the helt an extra twist as they pass from one pulley to the other. The helt then will stand vertical at two points, marking the thirds of the distance hetween the shafts, and if the pulleys are of such sizes that the helt crosses at or near one of these points they will run smoothly again and with very little friction.

Thunder Mountain and Mackay, Idaho.

Written for the MINING AND SCIENTIFIC PRESS by ROBERT BELL.

The extension of the Salmon River Railway through the central part of Idaho to the western horder of the State promises to mark a most important period in the mining history of this commonwealth, as it will open up an easy means of access to one of the largest, richest and at present most inaccessihle undeveloped mining fields in the United States.

This region of rough mountains and canyons is well watered and timhered, and is especially adapted for metalliferous mining. It is a region occupied almost exclusively hy primary and igneous formations, the richness of which in metals is already demonstrated in a measure hy the fact that from within the Salmon river drainage, to which it is principally trihutary, there has heen produced to date fully $75,000,000 worth of placer gold. In addition to gold, which is found associated with almost all the ore of this region, the other metals, particularly copper, are exceptionaly well represented.

The new Thunder Mountain district, which promises to prove a great producer of gold, is situated hetween the head of Marhle creek and Big creek, two trihutary streams that lap past each other at their source and enter the main Middle Fork of Salmon river 60 miles apart from the west side.

The Government map of Idaho does not show the location of Thunder mountain nor of Marble creek, hut hy measuring off 20 miles on the map northwest of the mouth of Loon creek, which enters the Middle Fork from the east, ahove Camas creek, you will have the initial point.

The formation of Thunder mountain consists almost entirely of eruptives, principally in great heds, dikes and overflows of rhyolite porphyry, with immense accumulations of hrecciated material and occasional domes and vents of hasaltic andesite. Pieces of charred and petrified wood that seems to have heen picked up hy a stream of rhyolite mud are occasionally found rich in gold, also hands of smooth-grained felsite rock, slaty sections of which have a very resonant sound, like phonolite, when struck with a steel tool, hut lack the grain and structural characteristics of Cripple Creek phonolite.

The rock formations of the region hounding Thunder mountain to the northeast are principally crystalline schists, gneiss, and great systems of diorite, syenite and porphyry dikes, which carry some immense hedded deposits of copper sulphide ore, rich in gold. Southwest of the mountain the formations are principally granite. with extensive igneous intrusions.

The hest known development of this new El Dorado at present is the Dewey group of claims, situated near the summit of Thunder mountain at an altitude of 8000 feet. This property was hought last fall from the original locators hy W. H. Dewey and associates of Pittshurg, Pa., for $100,000. It has heen visited and examined hy a numher of mining men and is described hy them as a hed or zone of soft friahle rhyolite porphyry of a light gray color fully 600 feet wide, and exposed on the Dewey property for several thousand feet. The deposit has already heen developed hy 700 feet of tunnels and crosscuts that have gained a vertical depth at one point of 140 feet. The entire length of all these workings is in pay ore that is said to carry an average value of $7 per ton in free gold, with one quartz seam 4 feet wide, assaying $1000 per ton. Some astonishingly rich specimens have heen hrought out from this pay streak. One of them recently on exhihition in Boise weighed thirty pounds and was estimated to contain over $300 worth of visihle gold.

With unlimited water power in the near vicinity of the mines it is estimated that this ore can be mined and milled on a large scale for not to exceed $1 per ton. The company already have a 10-stamp mill on the mine, which was packed in on mules and is now in operation, for the purpose of making practical working tests, and they are now planning for the erection of a 100-stamp mill as soon as a wagon road can he huilt into the property.

The gold occurs native in the rhyolite matrix, in size from the finest particles to large dendritic accretions lining the joint planes, some of them as large as the palm of a man's hand. The material is perfectly free milling so far, and, with the exception of a faint yellow stain, suggesting the presence of lead, and a slight accumulation of live iron pyrites in the fracture planes, shows no other evidence of hase ore. The Thunder mountain gold is light colored; it carries a large amount of silver and is worth ahout $12 per ounce.

A large numher of claims were located in the immediate vicinity of Thunder mountain last summer, hut a vast region of practically unexplored country surrounds it for many miles, and several similar centers of eruptive activity are known of that may prove equally as rich upon investigation. The ahove is helieved to he especially true of the country lying east and along the road approaching Thunder mountain from Mackay and from Salmon City. At Carmen creek, Deep creek and Silver creek in Lemni county, and at Lava creek, Stanley hasin and Jordon creek in Custer county, centers of volcanic activity have occurred which greatly resemhle Thunder mountain, with great heds and dikes of light colored volcanic material that carrys gold values at the surface, from a trace to $6 or $8 per ton, and occasional specimen values that run up in the thousands.

There are half a dozen ways of approaching Thunder mountain, all of which possess local geographical advantages, hut most of them are over highly elevated mountain roads and trails, where the snow usually lies deep and late in the spring, making travel not only slow and difficult, hut also somewhat dangerous at that period of the year.

The nearest railway approach to the new El Dorado is Mackay, the present terminus of the Salmon River Railway, from where there is an excellent wagon road to Singiser, 100 miles distant, and from Singiser it is only 60 miles over a good trail to Thunder mountain. This route will he open to safe and convenient travel fully a month or six weeks earlier than any other, owing to the fact that on an average it traverses a much lower line of elevation, with the only one important summit to cross, the Morgan Creek pass, at an elevation of 7500 feet, where deep snow is likely to he encountered for a distance of ahout 6 miles, as against 25 to 100 miles of heavy snow country over the various other roads. Geologically this road to Thunder mountain traverses the most varied and interesting section of Idaho, while the facilities it offers for prospecting, hunting and fishing, and for good water and grass during the open season, are unexcelled.

One railway company has a large corps of engineers in the field at the present time permanently locating their Salmon river line from Mackay toward Thunder mountain, and it is reported that active construction will he commenced as soon as a 25-mile section of the survey has heen completed, and the line pushed on to the Salmon river at Challis as rapidly as possihle.

The Salmon River Railway leaves the Butte hranch of the Oregon Short Line at Blackfoot, a station 24 miles north of Pocatello. The new railway strikes due west from Blackfoot hottoms across a hroad sagehrush plain to Arco, distant 60 miles out and situated at the entrance to the Big Lost River valley. Arco dates its existence from the arrival of the railway last Septemher. It already has a numher of very suhstantial huildings. It is the natural supply and shipping point for extensive mining in Little Lost river to the north. The ores of this district are principally lead, silver and copper, hut all carry a little gold. Some of the deposits are very large concentrating propositions. The formations consist principally of quartzite, dolomite, hlue lime and shale, and great intrusions of gray diorite and quartz porphyry. South of Arco the Lava Creek district is 16 miles distant over a good road. This district has heen noted for its production of very rich horn silver ore. It has as well mines on large, well defined fissure veins carrying silver-lead ores. There is also a dike of vesicular gray porphyry several hundred feet wide that carries from a trace to $10 per ton in gold. The formations are similar to Little Lost river, with a good deal of lava added.

The town of Mackay, the present terminus of the Salmon River Railway, 85 miles from Blackfoot, was laid out on the level hottom of Big Lost River valley Oct. 1, 1901, at a point 4 miles ahove the old town of Houston. It now has 150 suhstantial huildings, including a first-class hotel, and, though less than four months old, already has a population of 1200 people.

The White Knoh Copper Co., in which John W. Mackay and associates of New York are interested, has heen developing the White Knoh group of copper mines with a force of from forty to fifty men for the past three years, and are at the present time employing over 200 men. They have, it is claimed, pay ore already hlocked out sufficient to run their large smelting plant for several years to come. It is estimated that the improvements projected hy this company and now well under way will have cost not less than $1,000,000 when completed. Among the principal features of this equipment is a complete copper smelting plant, with a daily capacity of 600 tons, nearing completion, planned to make copper direct from the ore in one operation. The ores are thoroughly oxidized for considerahle depth helow the surface, and, from the comhination of their enclosing formations and matrix, are practically self-fluxing. The foundations of this plant are so designed that it can he very conveniently changed to a matting plant when the sulphide ores make their appearance at deeper levels.

The White Knoh copper vein is a contact hetween a hlue lime hanging and porphyry foot wall. It is from 10 feet to 300 feet wide and has an aggregate of fully 2½ miles of connected development openings, including one vertical shaft 700 feet deep. In the lower levels some very high-grade glance and other sulphide ores are commencing to make their appearance. All the ores are said to carry enough gold and silver value to cover the cost of mining and smelting. The mine is so situated that it can he opened at the surface and worked as a quarry to a considerahle depth, which will admit of the mineral heing delivered at the smelter at a small cost.

The smelter is situated in the valley 2000 feet vertically helow the mine and on the southwest side of the Mackay townsite. The ore will he delivered at the smelter over an electric switch-hack tramway 10 miles long, to he supplied with power from the smelter plant, where five 100 H. P. hoilers have already heen installed for that purpose. The grade for the tramway has already heen completed, track laying is now progressing and it is anticipated that the whole plant will he put in commission hy April.

From Mackay a first-class stage road follows up the valley of Big Lost river, over a low grassy divide at Willow creek and strikes the Salmon river at Challis, 50 miles distant. At Challis, which is the county seat of Custer county and an excellent outfitting point, the traveler may take his choice of several well-estahlished roads and trails to Thunder mountain, hut for the henefit of those intending to visit the new district early in the spring and wanting to avoid the inconvenience and dangers of deep snow, we will first describe the Singiser route, which will he the earliest to open.

Thirty miles northwest of Challis over a good wagon road, with easy grades, we cross the Salmon River range through the Morgan Creek pass at an altitude of 7500 feet. This is the only snowy stretch on the whole road and its extent does not exceed 6 miles in length, all the way through dense pine timher with no hald sidehills or danger from snowslides. Beyond the pass the wagon road extends hy easy grades down Panther creek to Prairie hasin, 10 miles. Thence over a low grassy divide to Silver creek and the waters of the Middle Fork of Salmon river, we land in 10 miles more at the Three Forks of Camas creek, a short distance helow Singiser, which is at present the end of the wagon road.

From Three Forks there is an excellent trail down the main Camas creek to Middle Fork of Salmon river, 16 miles; thence up Middle Fork to the mouth of Marhle creek, 25 miles; thence up Marhle creek 25 miles to the heart of the Thunner Mountain district, making the distance from Mackay hy this route to Thunder mountain 166 miles, over the easiest road that at the present time penetrates the new district. This route can he shortened 16 miles hy following an excellent trail up the west fork of Camas creek, over a summit to Warm Spring creek, which connects with the Middle Fork river trail at the mouth of Loon creek.

The last 60 or 70 miles of this route traverses a country of remarkahly varied mineral resources that should he of especial interest to the miner and prospector.

At Prairie Basin a discovery of heautiful gem opal was made a few years ago in great houlders of gray trachyte. These gems were of exceptional heauty and quality. They have heen classified as heing of the hydrophane variety and worth $10 per carat.

On Panther creek, which is the main stream of this grassy hasin, the Minert placers carry a hedrock pay streak worth $1 per cuhic yard in coarse gold, and in addition to the gold a good handful of 70% stream tin to every pan of hedrock pay gravel. With particles of porphyry matrix sticking to some of the nodules as a guide, the original vein source of this stream tin still remains to he discovered.

Fifteen miles northeast of Prairie hasin, near the headwaters of Copper creek and Deep creek, an area several miles in extent is occupied hy beds and dikes of rhyolites, trachytes and hreccias, from which some good gold assays can he ohtained, and where specimen gold float of fahulous richness has heen found.

Northwest of Prairie hasin 12 miles the Yellow Jacket mine, carrying a 40-foot vein of $5 free gold ore, is equipped with a 60-stamp mill, and within a mile of the mill some copper-gold deposits are heing opened up. The principal copper showings are the New Columhia, which has a large vein of rich copper, gold and silver-hearing ore in a contact with shattered quartzose schist and a dike of diorite. This vein is soon to he tapped at considerahle depth hy a 1500-foot crosscut tunnel, which has already advanced 1300 feet. Adjoining the ahove property the Steen mine, 1000 feet down the mountain, is developed to a depth of 150 feet, and shows a stockwork 100 feet wide of copper-iron sulphide hands that carry an average value of 3% copper and $3 gold, including some pay veins of very much higher grade mineral.

Immediately southeast of Prairie hasin the Silver Creek–Singiser district, which is quite extensive, is occupied almost exclusively hy light-colored igneous rock and hreccias, principally of rhyolite varieties, and very much resemhle Thunder mountain.

The placer gold found on Silver creek is only worth $12 per ounce, in contrast with the $18 dust of Panther creek, 2 miles distant. The principal source of this low-grade gold is at the Ramey mine, near the head of Silver creek.

The Ramey group covers a dike of mottled rhyolite porphyry 200 feet wide, carrying talcy shear lines very rich in gold, associated with specks of silver sulphurets. The whole width is said to carry paying values that would yield a good profit hy cyanide treatment.

At Singiser the True Blue mine has heen developed hy an incline shaft 250 feet deep and 2000 feet of levels. This is a vein of quartz and porphyry hreccia 30 feet wide hetween walls of white rhyolite hreccia and mottled hlue pyritic porphyry, and carries an average value of $14 a ton, with a pay streak on each wall 6 inches to 6 feet wide going from $60 to

$100 per ton in a proportion of about 50% gold and 50% silver.

Placer bars rich in high-grade fine gold are found all along the trail up Middle Fork. Loon creek, with a $5,000,000 record of placer gold produced, drains a formation of pink-stained granite very much resembling that of Pike's Peak, Colo.

Passing over the trail up Marble creek, the characteristic eruptive formations of Thunder mountain commence to make their appearance a few miles above its mouth.

From Challis several other roads and trails lead to Thunder mountain. Going from Challis over the old Custer wagon road up Garden creek 10 miles, we strike a trail over a low ridge to Challis creek, where a new trail is now being cut through the Challis Creek pass to Loon creek and the Middle Fork of Salmon river. This trail will be gotten in shape for later spring travel and will make the most direct and shortest route possible from railway connection to Thunder mountain. The distance from Mackay by this way will be 140 miles, and when the railway reaches Challis, about next August, the distance will be reduced to 90 miles.

From Challis the State road follows up the main Salmon river, over which an excellent daily stage service connects via Clayton, Bayhorse and Robinson with Custer and Stanley basin. At the latter place it connects with the Ketchum-Thunder Mountain road. And from Custer, Clayton and Bayhorse good trails can be found passing directly over the Salmon River mountains to the Middle Fork trail.

At Bayhorse the Ram's Horn mine, which is opened on a true fissure vein in metamorphic slate and greenstone, has 10 miles of connected open development, including one adit tunnel, driven on the vein for 3000 feet, that has gained a face depth of 2000 feet. This mine carries gray copper ore in a gangue of high-grade iron carbonate. It has a bullion record of over $2,000,000 and is claimed to have over $2,000,000 worth of measurable ore blocked out at the present time. This mine shipped two twenty-ton cars of ore last summer from development work that samples 900 ounces in silver and 30% copper per ton.

Adjoining the Ram's Horn on a parallel vein, the Sky Lark mine has over 30,000 feet of development and a bullion record of $2,800,000. This mine has been continuously operated for the past twenty years and shipped 500 tons of high-grade ore last summer. Ten miles south of these mines, from the same formations and character of ore, the Poverty Flat group of mines have produced $700,000 from a vertical depth of less than 200 feet.

The Custer district is one of the most remarkable volcano centers in the West. It consists of at least a dozen volcanic peaks fully 10,000 feet high, composed of syenite, diorite, porphyry, andesite, rhyolite and basalt. This district is fully 15 miles square and is surrounded entirely by a granite country. It has two distinct systems of fissure veins that have made an aggregate production in gold and silver of $12,000,000, the bulk of which being derived from the Custer-Lucky Boy group.

The Lucky Boy mine is being very successfully operated at the present time with a force of 75 men and a 25-stamp mill. There are also several other properties that are being quite actively developed in this district at this time. The value of the ores of the Custer district are about equally divided between gold and silver and have shown some high values.

South of Custer 16 miles, the Stanley Basin district offers a very inviting field for the prospector. This is an old placer district with a production of over $1,000,000. The formation is soft crumbly granite, and the basin is ribbed with parallel dikes of quartz porphyry and trachyte, associated with veins of curly agaty quartz, intermixed with a good deal of fluorspar.

Some of the placer gulches were worked right up to and into these big dikes, and the original source of the gold was found lining the shrinkage and structure planes of the porphyry. It is associated with brown oxide cubes after iron pyrites and produces some very handsome specimens.

Some of these dikes carry live iron pyrites that do not show a color of free gold by panning, but assay several ounces of gold to the ton. The combination of conditions at this district resemble Cripple Creek in some respects, and may result in the discovery of rich tellurium compounds.

Such are a few of the principal mineral features of the country approaching Thunder mountain via Mackay and Challis, and associated with them are hundreds of fine prospects and hundreds of square miles of practically unexplored country, whose varied conditions offer close comparisons with some of the most famous mining districts of the world, and exceptional chances for the discovery and development of rich mines.

SEVERAL processes for the production of silicides in the electric furnace have lately been discovered. A new use for these compounds has been proposed, founded on their decomposition, when cold, by water. They are formed by the reduction with carbon in the furnace of any salt of the alkaline earths with quartz or sand, and, being very fusible, readily flow out from the mass. They are not new compounds, magnesium and calcium silicides having been discovered in the middle of the last century. But it is stated that the $CaSi_2$, $BaSi_2$ and $SrSi_2$ prepared as above yield, with water, a copious and cheap supply of hydrogen, leaving hydronides of the alkaline earths, which are of commercial use. The freedom of the hydrogen, so prepared, from impurities makes the process of considerable commercial importance.

The Edges of Drill Bits.

TO THE EDITOR:—There are two kinds of bits for hand drills (in mining) in vogue, viz: The "square" and the "round" bit. As Fig. 1 shows, the cutting

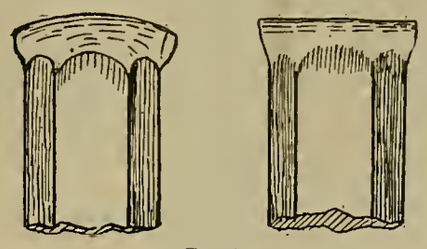


FIG. 1.

edge of the square bit is a straight line, that of the round bit the segment of a circle.

Everything else, such as bevel, quality of steel, temper, etc., being equal, which bit will cut the fastest in any kind of rock with the same work with the hammer?

Everything again being equal, will one bit stand more punishment, particularly referring to the corners, than the other, and, if either, which one and why?

In dressing the tool some blacksmiths draw the corners of the bit with the side of the drill-sharpening hammer and then hammer the steel back with face. Others "squeeze" the corners out with the face of the hammer and then dress it back into shape with the side of the hammer. Does either method possess a superior merit in regard to the lasting quality of the drill bit, and, if so, why?

Octave, Ariz., Jan. 17. C. P. SCHACHMAN.

[The surest way of obtaining an indisputable answer to the first query is to make two drills, one with the straight bit and the other with the round, and try them under the same conditions for speed of cutting. Without doing it, and without ever having done it, the writer's opinion is that the round bit will cut the fastest. The straight-edge bit will wear on the corners, round and dull at the same time, and will diminish the bore of the hole more rapidly than the round-edged bit. It will have a tendency to fitcher, which will make its speed of cutting uncertain. Generally the round-edged bit should cut faster, because it will cut more.

The round-edged drill will stand the most punishment. In Fig. 2 is a sketch of the bottom of a drill

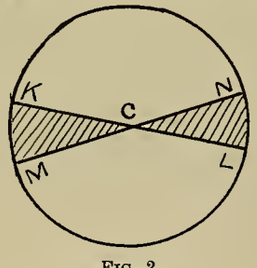


FIG. 2.

hole. The drill, in cutting, is turned after each blow of the hammer, so that the edge of the bit by the next blow is driven into the rock in a line, making a more or less acute angle with the line of the preceding blow. The effect is to split off the two rock chips filling the two acute angles. Referring to Fig. 2, the first cut of the bit being in the line K–L, and the second cut being in the line M–N, the effect is to cut out the two rock chips in the angles K–C–M and L–C–N. It will be noted that these two lines of cut cross in the center, C, and that all the successive cut lines must pass through the common point, C. With a straight-edge bit it is clear that the load of the work on the cutting edge would be unequally distributed, the center having the least load of work, since it is all on one point and the load of work increasing from the center out to the corners, as the distance increases the width of the angle of the chip. The heaviest load of work is on the corners, where the width of the chip is greatest and where it is joined to rock on the side of the hole, making its resistance to chipping greatest. The constant tendency would be, therefore, to make the center cut go ahead of the circumference cut. The whole force of a blow of the hammer, then, comes on the corners, instead of being distributed equally along the whole cutting edge. The drill may then break on the corners, or, if it misses that, it wears down rapidly on the corners and has to be retired. The round-edge bit is the fitting of the tool to meet the condition of its use. The bearing of the bit at the instant of striking the hammer blow is put on or near its center. The full force of the blow is more evenly distributed along the entire edge of the bit. It might seem that the result of successive blows would bring the curved edge in the same relation to the bottom of the drill hole as described for the straight-edge bit. This is not, however, the fact. The cutting force at the edge of the curved bit takes a direction radial to the curve of the edge, instead of being direct in the line of the blow. More of the effect of the blow is thus taken up by the rock toward the periphery of the drill hole.

To be exact, the corners of the round-edged bit do not stand more punishment than the corners of the straight-edge bit. They simply have less work thrown on them, and so last longer.

As to third question, the writer does not see a conclusive answer as to the preferable practice. It would seem to be a matter of the personal equation. The first-described method would possibly have a slight advantage over the second, in that the fiber of the metal is laid when it is hottest—at the beginning of the working. The steel crystals are not so readily elongated in direction perpendicular to the cutting edge by hammer-face blows as by the "squeezing" effect of the drawing blows of the side of the tool. What is here written is intended as suggestive, rather than conclusive. It is one of the problems of practical mining which in the end must be worked out by practical doing. It can not be settled by the most refined analysis by the pen of a writer. The limitation of the latter is the expression of the meaning of the results of many trials.—ED.]

Nitrate Deposits, Humboldt County, Nev.

Written for the MINING AND SCIENTIFIC PRESS by THEO. H. VAN WAGENEN, E. M.

There is plenty of low-grade nitre rock in the lower valley of the Humboldt, not far distant from Lovelock, Humboldt county, Nev. The region has, at some time in the distant past, been the seat of numerous hot springs rich in minerals. These springs lie along a line extending in a general north and south direction, upon the east side of the valley, and probably issued from a fault fissure having a length of 25 miles or more. Most of the cones built up by these springs have been buried since their extinction under the enormous amount of alluvium which the river has brought down during recent geological time, and which makes its broad valley at the present such a fine agricultural region; but a few are still partly or wholly exposed. In addition to the sodium and potassium nitrates which the material in and around these dead springs affords, analysis shows the presence in greater or less quantity of sulphur, salt, iodine, bromine, copper, gold and silver. Some who have given the region study believe that much of the stuff that is exposed in the shape of cones, cliffs and dust beds, can be successfully worked for their precious metal contents, as well as for the numerous other valuable substances they contain.

At the foot of Humboldt Sink these minerals (mainly sodium nitrate) have been found in considerable quantity in and around an extinct hot spring that at some time must have been of huge dimensions. Some Lovelock people have located and patented 320 acres of this deposit, and have bonded it to a Detroit, Mich., company, who are preparing to explore and exploit it thoroughly. Work will begin upon it early in the spring. The people interested are making no large claims as to the value of the stuff, and in fact make no claim at all, being as yet quite uncertain whether it can be handled and treated at a profit. They propose to give it a careful and thorough trial this spring, by endeavoring to develop a quantity of material of sufficiently high grade in the nitrates to permit of its being worked at least for its nitric acid contents; and if it appears that the rock can be successfully leached, and the desirable chemicals economically crystallized from it, large works will be erected before the end of the current year.

CONGRESSMAN CUSHMAN of Washington has introduced a bill providing "that hereafter all locations of placer mining claims in the district of Alaska shall be made in person by the claimant, and hereafter all locations of placer mining claims in the district of Alaska by agent or representative or under and by virtue of power of attorney shall be void."

Compressed Air for Operating Pumps.

Aside from the simple Pohle air lift, there are six other systems for raising water in which compressed air is used as the working medium:

1. Displacement pumps—full pressure.
2. Displacement pumps—expansion.
3. Direct-acting pumps—full pressure.
4. Direct-acting pumps—expansion.
5. Air lift pump—combined with displacement pump.
6. Pumps operated by air motors.

The simplest of these is the displacement pump for direct and full pressure. In certain industries acids and commercial liquids have been transferred for some time by air pressure acting on the surface of the liquid-confined tank, and strainers and agitators are often used in the same way.

The principle has been extended more recently to a form of displacement pump for raising and forcing water from a distance when the source is a pond, dug well, river or other surface supply. The same apparatus in a slightly modified form is also used to raise acids and heavy chemical solutions or to lift sewage to a higher level; for pumping marl, paints and other semi-liquids.

In its simplest form the device consists of two chambers of a material unaffected by the liquid to be handled and submerged in the liquid. The chambers fill alternately through openings in their bases and the material is forced out through a common discharge by direct air pressure, acting without the friction, leakage and wear incidental to friction pumps. The valve for alternately filling and emptying the chambers is above the liquid surface and where it can not be affected by direct contact or by any fumes or corrosive gases given off.

The height to which water can be raised by this means is limited only by the pressure of the air used to operate the pump, and the quantity raised will in a like manner depend upon the volume of air forced into the chamber per minute. These pumps are built in sizes up to 1500 gallons per minute for all varieties of service, such as draining sumps or dips, for which purpose they are unsurpassed, because of their automatic starting and stopping—according to the presence or absence of water. They use air only in proportion to the accumulation of water.

They form a very reliable pump, use no oil or packing, are unaffected by grit and repairs are insignificant, there being practically no repair or maintenance expense when once they are installed and adjusted.

The system lends itself most satisfactorily to small municipal water works and effects noticeable economy, the water being supplied to the pump cistern from wells by the air lift, using the same plant for the two purposes. All other pumps are thus done with, no standpipe is required, the steady, elastic air pressure forcing the imprisoned water into the service mains in a continuous stream. The whole system is efficient, simple, self-contained and economical in first cost and cost of operation.

With air at ninety pounds pressure per square inch, allowing for pipe friction, air absorbed by the water and a small addition necessary to cause the flow, it is safe to assume 9 cubic feet of free air for each cubic foot of water pumped to an elevation of about 210 feet, as approximately stated.

With the displacement pump 1 cubic foot of free air at ninety pounds pressure will do 175 foot-gallons of work.

The efficiency of this system, employing only ordinary single stage air compressors and lifts not exceeding 250 feet is greater than that obtained with the usual direct-acting single cylinder pump using air instead of steam.

If compound compression or two or more stage compression is used, better results may be expected, especially if the water pumped is warmer than the air arriving at the pump. Generally speaking, the efficiency in this case may be taken as between 15% and 22%.

Compressed air can also be used to operate steam piston pumps, and when these are located outdoors some distance away from the boilers it will run them with greater economy than can be done with steam, because of the rapid condensation of steam in the exposed pipes leading the steam to the pumps. Authorities estimate that with coal at $2 per ton every foot of uncovered 2-inch pipe costs by condensation about $1 per year, and even with covered pipes, when long, the condensation is a considerable factor.

In addition there are no hot pipes, becoming leaky through alternate contraction and expansion. There is no exhaust to dispose of, the pumps take less oil, are more reliable and last longer.

Even under favorable conditions a steam pump is not an economical machine, and the simple direct-acting form is known as the least efficient of all steam users, and hence air users, as a result of the large clearance space and the impossibility of obtaining a full stroke, besides the considerable condensation which unavoidably occurs.

The average mechanical efficiency of the pump alone will be about 65%, although in many cases 50% is nearer the mark. The total over all efficiency, from steam used to water raised, will average nearer 12% to 20% in most plants, as actually operated.

By means of compounding and reheating or interheating the air, better results are obtained, the average running up from 15% to 30%. Experience has shown that, for average conditions, using air at ninety pounds pressure per square inch, 1 cubic foot of free air will do approximately 135 foot-gallons of work.

On the basis 111 cubic feet of free air will be required to raise 150 gallons 100 feet high per minute, and assuming 20 delivered H. P. necessary to compress 100 cubic feet of free air per minute, we have 1.1×20, or 22 H. P.

In the case of pumps working either under full pressure for the full stroke, or expansively, there is a liability to "freezing up" in the exhaust passages and ports or at the exhaust, an annoying and sometimes serious matter. Two general ways to avoid this are adopted—one to spray a small jet of water taken from the pump discharge directly into the exhaust of the air cylinder, a rough and ready means, but one that works well.

The second and best method is to use compound pumps which permit the introduction of an air heater between the cylinders, besides having a higher mechanical efficiency of 70%.

This interheater is a copper coil immersed in a tank of running mine water. Or it may be a regular feed water heater put to this use. The exhaust air, usually much colder than the mine water, absorbs sufficient heat from it to allow a second expansion in the low-pressure cylinder without carrying the exhaust temperature below the freezing point.

The average total efficiency to be expected with this arrangement is about 33%, while if in addition the air is obtained from a compound compressor the efficiency may reach 38%.

For purposes of comparison we may assume that: One cubic foot of free air compressed to ninety pounds per square inch will do 232 foot-gallons of work.

The application of reheating and other methods of increasing the efficiency of pumping or air-driven power outfits depends to a considerable extent upon local conditions.—Compressed Air.

Oro Grande, Wickenburg, Ariz., Mines.

[STAFF CORRESPONDENCE.]

The property of the Oro Grande M. Co. comprises a group of nine claims near the Hassayampa, 5 miles northeast from Wickenburg, Ariz. The outcropping here shows a main ledge running northeasterly and southwesterly through a diorite formation, and traceable about 4000 feet. Development aggregates about 1500 feet, there being a 300-foot shaft, with 500 feet of drifting on the 100-foot level, next to the east wall. Several crosscuts from this drift westward shows the ledge to be 75 to 130 feet wide. On the 200-foot level is 150 feet of drifting with a 100-foot crosscut from wall to wall. There is similar work on the 300 level. The ledge matter is talcose, carrying iron oxide stringers. The values, consisting of free gold, are carried in both the talc and iron. The vein also contains bunches and horses of diorite, which are not mineralized. There are also stringers of quartz and calcite spar which carry values. Eight samples of this ore show an average of $70 gold to the ton of ore. A parallel vein, included in this group, also shows up well in the outcropping and in surface workings. The property is under the management of Geo. B. Upton, with B. O. Hatfield as foreman, both being interested in the property. The shaft is equipped with a gasoline hoist.

Some development is in progress on the Sahuaro, 2 miles east of Wickenburg, native silver having been found in sinking a shaft. E. J. DeWitt is in charge for Colorado Springs parties, who have a bond on the property. The extension of this is being worked by R. G. Brown of Red Bluff, Cal.

The Keystone, which has changed hands, will soon be started up, it is claimed, by Pittsburg people. It is also stated that F. X. O'Brien's mine, 16 miles northeast of Wickenburg, has been bonded to people formerly interested in the Keystone.

The United G. & C. Extraction Co. of Cleveland, Ohio, have made a payment of $3000 on J. Ellis' Alice group, near Gilbert.

The mill of the Ardath M. Co., southeast of Wickenburg, is being put in condition to run, and is in charge of Capt. Cree.

The American G. & C. Co. have eight men at work on the Santo Domingo. Geo. W. Morgan also has a small force at work on his group near Gilbert.

At the Vulture mine cyanide work on mill tailings is going on and a crosscut is being run at the 200-foot level in the new shaft. Geo. W. Sanders is Supt.

A 200-foot shaft is being sunk on the Angell copper group near the Vulture. This mine has been sold to the Idaho Con. C. Co.

A 20-stamp mill is being put up on the Socorro mine, 40 miles west of Wickenburg, in the Harqua Halas. Jno. Witherly is Supt. The ore is suited to concentration.

Wickenburg, Jan. 17.

Washington Camp, Arizona.*

[STAFF CORRESPONDENCE.]

In Washington camp, Santa Cruz county, Ariz., the ore bodies are found in a lime belt, approximately 3000 feet wide and over 7000 feet in length. Within this belt are numerous mineralized ledges, which in the main take a northerly and southerly course. In most cases the cropping at the surface is very distinct, though in others the ore is beneath a lime capping. Some of the veins, as shown by development, are between lime walls, though the richer bodies appear to be along the borders of the lime belt, in the contact between lime and porphyry and between lime and quartzite.

The ores comprise iron, copper, zinc, lead and silver, with considerable garnet in the gangue. Near the surface the vein matter is oxidized, merging into the sulphides at varying depths. The oxidized ores are rich in copper, silver and lead, the zinc and iron being found mostly in the copper sulphides. The original workings in this camp, which date back to the '60s, were for the silver only and work apparently ceased on reaching the chalcopyrite. It is estimated that the sulphide ores of the camp will run 20% zinc, 7% copper, 10% lead, 30% iron and 10 to 30 ounces silver. These conclusions are reached as the result of sampling, mill work and smelter shipments from a great many open cuts, shafts, tunnels and winzes on different properties of the district. The principal holdings of the camp are included in four groups—the Duquesne, belonging chiefly to G. Westinghouse; Pride of the West, whose stockholders are principally Colorado men; the Poole group, being developed under the direction of E. M. Ray; the Copper Century, owned by Boston parties and managed by G. A. Lonsberry.

The Duquesne has a plant of hoisting machinery, a 640-foot shaft and a considerable amount of underground work, as well as good buildings. No work is in progress at present, though the owner is represented here by J. F. Tenner.

The Pride of the West, adjoining the Duquesne on the north and west, is well developed through tunnels and shafts, disclosing a vein from 8 to 30 feet wide, carrying the typical copper-zinc-iron-lead sulphides of the camp. The property includes a concentrating mill and smelter, both of which are being remodeled and enlarged. The mill, when newly equipped, will contain two crushers, five sets rolls, four magnetic separators, nine Wilfley tables and a roasting furnace. The plan is to convey the ore from the rolls to the roaster, subjecting it to moderate heat to magnetize the chalcopyrite before passing the material through the magnetic separators, which part it from the other constituents. The smelter will produce a matte. E. Gee is manager of this property.

The Copper Century group covers about 250 acres and adjoins both the Duquesne and Pride of the West. It includes the Belmont property, in the old workings of which are exposed great bodies of copper carbonates near the surface and chalcopyrite at greater depth. This belongs to San Francisco parties, but is bonded to Mr. Lonsberry and associates. There are other outcropping ledges covered by the Copper Century group, on which surface workings go into a good grade of the characteristic ore of the camp. Tunnels are being driven and two gasoline hoisting plants are being put up where shafts have been started. All work observed is in ore.

This camp is 20 miles from the railroad, being equi-distant from Patagonia and Nogales. The hills of the district are covered with a fair growth of scrub-oak timber, making fuel plentiful.

Washington, Jan. 15.

*See illustration on first page.

Behavior of Iron When Magnetized.

TO THE EDITOR:—In the last issue of your valuable paper there appeared a "Concentrate" with regard to the behavior of iron when magnetized. Some appeared to doubt the mere statement and I thought it might be of interest to confirm the statement.

According to the "Concentrate," "a bar of iron increases in length when first magnetized, but upon increase of the magnetizing force the effect is reversed and the bar shortened."

First consider the molecular condition of an unmagnetized piece of soft iron. Each molecule is supposed to have an equal north and south pole, but the magnetic force lines of these poles are neutralized by the surrounding poles in adjacent molecules.

Under the action of a small magnetizing force, such as a slight electric current through a coil of wire around the bar, the molecules are pulled so that the north poles are faced toward one end of the bar and the south pole toward the other end of the bar. This pulling force being small may not move all the molecules, but such movement will slightly lengthen the bar.

But if a stronger current be sent through the bar coil the bar will first lengthen and then quickly contract, because of the attraction exerted between positive and negative poles, which attraction is enabled to act when the magnetizing force is strong enough. T. S. J.

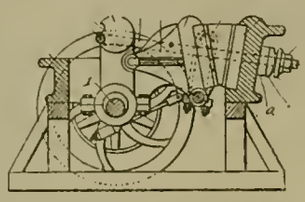
Denver, Colo., Jan. 20.

Mining and Metallurgical Patents.

Patents Issued January 21, 1902.

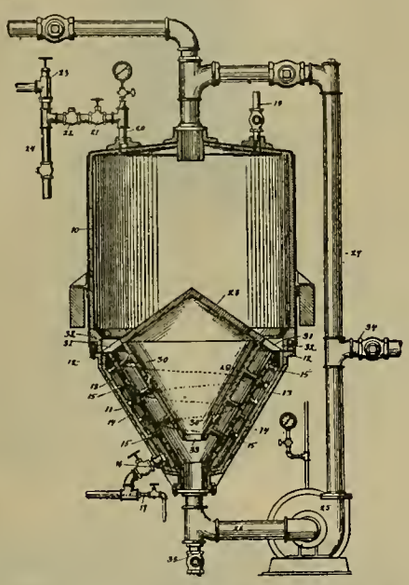
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

CRUSHING MACHINE.—No. 691,593; M. G. Bunnell, Chicago, Ill.



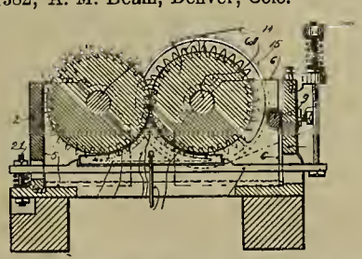
A rotary driving shaft provided with an eccentric; a pitman arranged upon and extending upwardly from eccentric, and actuated thereby; a vibratory crushing jaw arranged forward of pitman and supported by swinging links pivotally connected at their lower ends with lower portion of movable crushing jaw, and having their upper ends pivotally supported upon body frame of machine; a stationary crushing jaw arranged opposite to and forward of movable crushing jaw and backed by forward stationary part of body frame of machine; a couple of vibratory tension rods arranged as connections between pitman and stationary part of body frame and connected with latter to swing about an axis forward of movable jaw; means for adjusting length of each rod between the axis and connection of rod with pitman; means for permitting connection between vibratory tension rods and pitman to be adjusted toward and away from axis of driving shaft; and a power-transmitting arm arranged between movable jaw and pitman and connecting with latter at a point between axis of driving shaft and point of connection between tension rods and pitman.

METALLURGICAL FILTER.—No. 691,706; F. H. Long, Chicago, Ill.



A vessel having a conical filter septum and an outlet port for filtrate beyond such septum, means for establishing an end-to-end circulation of vessel contents above septum, a conical spreader and an oppositely facing conical baffle plate having a projecting spiral flange successively interposed between ends of vessel and arranged adjacent conical filter septum to intimately direct such circulation over its surface.

ORE CRUSHING AND PULVERIZING MACHINERY.—No. 691,582; A. M. Beam, Denver, Colo.

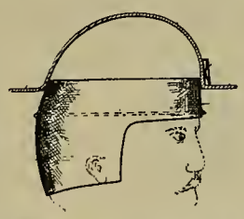


Supporting base, fixed shaft on base, a movable shaft mounted on base, rock and ore crushing rolls operated on shafts in alignment with one another and in rolling relation to one another; an adjustable, resilient buffer arranged to hold one roll in a predetermined, yielding and resilient relation to other roll, with a grinding block arranged to extend between rolls and engage their peripheral surfaces; supporting bar; spring between one end of bar and base, an adjustable bolt passing through spring and arranged to secure bar to base, a removable bracket secured to base, a vertical adjusting rod extending from free end of support through bracket, a spring around rod and resting in bracket, and a wrench nut threaded on rod and arranged to bear on spring.

ROCK DRILL.—No. 691,556; H. Leineweber, Chicago, Ill.

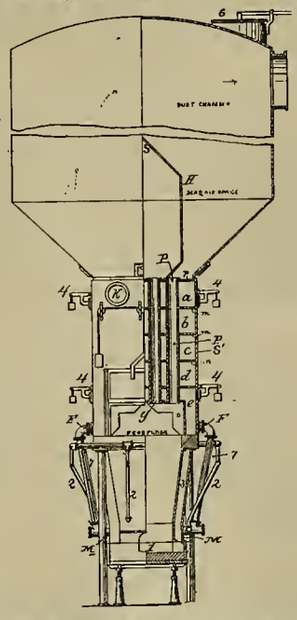
A support of a drill holding shaft, a fluid pressure actuated drill hammering device on forward end of shaft, a casing on opposite end portion of shaft slidingly mounted on support, a fluid pressure actuated shaft turning rotary motor in casing, a feed screw upon shaft, a friction clutch between shaft and feed screw, and an adjustable feed screw engaging and releasing sectional nut on support for advancing rotating feed screw and shaft.

MINER'S HAT.—No. 691,623; A. Harris, Calumet, Mich.



A depending flap of rubber or other material, a supplemental flap of soft rubber and an encircling wire band arranged at juncture of main and supplemental flaps.

COPPER SMELTING FURNACE. — No. 691,648; G. Mitchell, Los Angeles, Cal.



The crucible, a feed floor, and a metal chamber or section located above feed floor of furnace, a series of transversely arranged partitions forming a zigzag or serpentine passage for air blast, an air blast inlet communicating with upper end of such air passage, air pipes communicating at one end with lower portion of air passage or chamber, and their opposite ends with a series of tuyeres, and a series of vertical flues extending from furnace upwardly through partitions and air chambers or passages.

Workings of a Manager's Mind.

Written for the MINING AND SCIENTIFIC PRESS by CHARLES H. FITCH.

I knew a man who graduated as an engineer, but never became an engineer in any real sense. Some one may say that his name is legion, but I speak of only one. He was a conscientious worker. He got good marks as a student of lessons. He was put into a first-class shop, and did a series of mechanical tasks, but he said of himself: "I stuck too close to my work to learn much." It was a good hoisting engineer who wrote the words: "Unless above himself he elevate himself, how poor a thing is man." To be an accomplished manager, a man has got to get out of himself and his limited practice and go far afield for other experiences, and bring them back and look at his own old practice in the light of them. The story is told of a colliery boy who was taken by his father to the city of Glasgow. As the train rolled in through the lighted streets in the evening he exclaimed in new delight: "Father, this is a bigger mine than ours." That is as far as the story went in my reading. The point of humor was satisfied—that lad had called a city a mine. Now, calling a thing does not make it. That point was emphasized by Lincoln to the divines who called upon him to urge an impracticable emancipation of the slaves. He said: "How many legs has a sheep, calling the tail a leg?" They all chorused, "Five," but he said: "No; calling the tail a leg does not make it one." In this anecdote we have the great sweeping division between two schools of philosophy, the nominalists and the realists. The book man goes by names, and the first thing he knows he is dealing with empty names which have no things to "make good." But the colliery boy had come to a new thing, which not only filled the lines of the old name, but "burst its seams." It was a city. Chicago is symbolized by a Y on a terra cotta ground. The Y indicates the branching of the Chicago river. If we compare any two such things as a city and a mine, we must note that they have elements in common. But on some points they branch apart and are distinctively different. And to every idea connected with the bifurcated subject we bring the test of likeness or difference. Better still, we put pressure upon these ideas and consider the effect of forcing likenesses where they do not exist, and making differences where they do not exist, and some of the results are absurd. Looking at the absurdity very closely, however, we are likely to find in it some new utility which can be separated as a discovery, like a new element discovered from the inconsistent behavior of what was supposed to have been an old one.

California has supplied to the world a significant number of managers of the very largest foreign mining works. They have been called in preference to English engineers of excellent experience and German engineers of close (too close) scientific attainments, because they have the rather American habit of getting out of the ruts, and applying in one place ideas gathered from another place.

There exists a sort of dumb, hazy feeling that our own colleges and laboratories ought to teach the student what he requires—that he ought to get at Berkeley, or Columbia, or Hougbton, what he often goes to Heidelburg or Clausthal to obtain. Millionaire after millionaire comes to the fore with princely endowments, but what is wealth without idea? The agents of these wealthy purveyors of education seem to have but one idea, which they take turns using like a family toothbrush, and they all come out on that same model, like peas in a pod. We may inflate this one idea until it bursts, but it will never supply a liberal education. We might, it is true, study to provide different methods, antithetic schools side by side to sharpen sense and awaken the torpid univalve mind, but we don't, because the university regents are cyclopean of vision, and no person of wealth has had the wit to found a diversity.

The functions of a manager are considered somewhat diffuse. The assayer does something definite, and the surveyor does something definite, but the manager gets a big salary for looking on. It strikes people like it did the Arab who saw Theodore Thomas leading an orchestra. The son of the desert was most amused by the musician who performed with a stick upon an invisible instrument. What is the trick of the salary-getting American managing engineer? What is his process? There is no use in describing him as ambitious and enterprising—glib words used without analysis. Be thou likewise capable. Why, multitudes are wishing to be capable, and making no progress as they stand before that unsolved word.

Perhaps the habit is one of constructing in thought systems of comparison which less favorably equipped

men construct more slowly in fact, and arriving at swift practical judgments. The process is like the following. It requires both theory and practice.

Given all the elements of a problem solved in a known way. Ask what will be the effect of constructing a similar system of different elements. In what respects are the new elements like the old? So far the effects will be similar. In what respects are the new elements different from the old? So far the effects will be different. The situation may be new, but if it be filled out with familiar elements we know about what shape it will take.

Thus we are led to assume that we will get certain results dealing with partly new elements. This is theory. We try it, and find almost invariably that our theory is at fault. This is practice. It is necessary that we should show daring in our theory, and it is necessary that we should find it at fault if we are to learn anything or enlarge our destiny in any way.

Reams of articles have been written, and will continue to be written, setting theory and practice by the ears, and declaiming against one or the other. They are, however, parts of one process, that of constructing systems which by likeness and difference give us a store of useful comparisons. When we antagonize them it is like saying that one part of the experiment is right, but that the other should be omitted. Both are necessary. Both may be performed by one man, but in the past, in a flow of ideas which seems to have been "as slow as molasses," one man has "nobly begun" and suffered for it in one country, and it is reserved for another, ages later and perhaps of a different language and nation, to continue the work.

Bring together these remote but complementary movements of the mind, let their long-drawn, straggling course be gathered in the intellectual grasp of a single person, and we have a manager worthy of of the name, even though, like the leader of the orchestra, he appears to play upon an invisible instrument.

A New Mexican Mining District.

Written for the MINING AND SCIENTIFIC PRESS by E. B. VAN OSDEL.

No one who has traveled over the Mexican Central Railroad through the northern and western parts of the Republic can have failed to notice the lack of prominent peaks or lofty ranges. The mountains seem to be distributed along the plain in small groups here and there and are soon run down traveling by rail. With a few exceptions, such is the case along the same line in the State of Jalisco. Leaving Guadalajara, we are carried almost due west in general direction to the junction La Vega; thence a branch runs north and west for a score of miles, climbs over a range of hills and is at once in a most beautiful basin surrounding Magdalana lake, skirted by hills rich in the metals and filled with large haciendas and fertile ranches. On the southern side of the lake and on the foot of the adjacent hill is the town of Etzatlan, whose municipal records begin in 1521.

For the past two months the writer has been stationed in this town of 7000, in connection with a smelting plant and mining interests. The Spaniards and Mexicans have gophered about the hills for hundred of years and their prospect holes and dumps are everywhere on the slopes. The mining resources of the country are thus opened up to a certain extent, so that American capital, which is rapidly coming in, may get some idea of the wealth to be found here.

Sixty miles north of Etzatlan is the barranca of the Rio Grande de Santiago, with the town of Hostotipaquillo lying half way between. From Hostotipaquillo to the river is a district abounding in old silver mines which have been worked on a considerable scale. The veins are hundreds of feet in width, containing enormous quantities of medium-grade ore with stringers of a high grade. These mines have enormous dumps of low-grade sortings running from five to fifteen ounces in silver per ton. The ores are mostly siliceous, carrying some manganese, while galena, chalcopyrite and hematite are found in some.

South of an east and west line through Etzatlan is a range of hills filled with silver, copper and lead ores, but with considerable zinc associated with many of them. Some gold is found in the district. Feldspars abound in the region, while great porphyry dikes and beds of blue conglomerate with flinty dolerites are to be found in extensive masses. The ores are found mostly in feldspar, with some quartz. Silver, as chloride, bromide, sulphide and in the native wire forms, is abundant in the pure state. Galenite, cerrusite, bornite, chalcocite, chalcopyrite, sphalerite and native copper are found in large quantities. There are also large deposits of hematite and calcite suitable for flux. For treatment there are many amalgamation arrastras, a few stamp mills, also cyanide and hyposulphite leaching plants; but the common and characteristic mode of treatment is the patio process.

About 5 miles from Etzatlan in a southerly direction is the Santo Domingo mine. It has been worked for hundreds of years and is now in operation by the Compania Armonia. The rich ore from the mine is sent to smelters, while the medium grade is treated by the patio process in a mill situated half a mile up the nearest gulch from the mine.

There are three of the picturesque old Mexican structures near Etzatlan. Two are at the edge of town and are not in operation. The grounds are laid out as a park, with walks set in patterns of difierent colored stones, with drives and permanently constructed waterways. There are also several fragmentary structures for carrying on the process, using arrastras turned by mules for grinding, and the settling being done by boys performing a stationary run in the tank of mud. The Santo Domingo mill is situated in a large, level plat in the gulch, the grounds being walled in with the building in the central part.

Stalls and a yard for the mules occupy the upper end, while the patio, settlers and conceutrators occupy the lower end. In the building we find a disintegrating overshot wheel of huge dimensions and a group of large arrastras. Lately two boilers, an engine, crusher, quartz mill and feeder, also two Bartlett tables, have been installed. An office and storeroom are in close proximity and a large gateway and bridge lead over the creek. On the lower side of the main building are settling tanks, assay furnace, storerooms, hand concentrators and quicksilver settlers, which are turned by mules, grouped around the patio.

Only a limited amount of ore can be packed down by the mules from the mine, so that running is intermittent. The crushing is done by a Dodge crusher and Byan roller quartz mill, furnishing a 20-mesh product, which is carried out by a stream of water and settled in a series of three tanks. Forty tons of the remaining mud are shoveled out into a large pancake, called a torta, and a hot solution containing 150 kilos of blue vitriol and 2000 kilos of salt added, and about 350 kilos of mercury. The torta is mixed for seven days six hours a day by twenty mules, with the addition from time to time of more mercury in 30 kilo lots, until a batea test shows free mercury. Usually 500 kilos of mercury are required. When the torta is done it is shoveled into the settlers, to remove the mercury, and the tailings are settled in a tank to await concentration. The silver recovery in this way is 85% and the cost is between $7 and $8 per ton (Mexican money). With the old arrastra for grinding the cost was $11 per ton.

The ore carries 12 to 15 grammes in gold and about 920 grammes in silver per metric ton. The concentrates (4%) give 120 grammes gold and 2200 grammes silver.

The cost of treatment is distributed about as follows:

20 mules for 7 days	$25 00
4 men on torta for 7 days	10 10
Helpers	7 00
Mechanical loss of mercury	20 00
Chemical loss of mercury	33 00
Salt, 2 tons @ $35 ₱ ton	70 00
Blue vitriol, 150 kilos @ 8c	12 00
Total cost for a torta of 40 tons	$177 10
Cost per ton	$4 43
Cost of milling per ton	2 20
Administration	1 00
Total cost per ton (Mexican money)	$7 63
Total cost per ton (American money)	$3 75

As soon as the two Bartlett tables are in operation a much better grade of concentrates will be secured. Regardless of the latter, the margin over the patio treatment is more than $20 (Mexican).

WHEN a man has accomplished something of importance by dint of hard work and much experimenting there are always people who bob up and claim priority of invention. If an idea passes through a man's head that so and so might be done, and several years afterwards another man comes along and actually accomplishes what the first man dreamed might be done, the first man immediately claims that he was the originator of the idea. This is absurd. Credit should be given the man who not only thinks of an idea, but who carries it out to a practical end. The world is too full of dreamers.

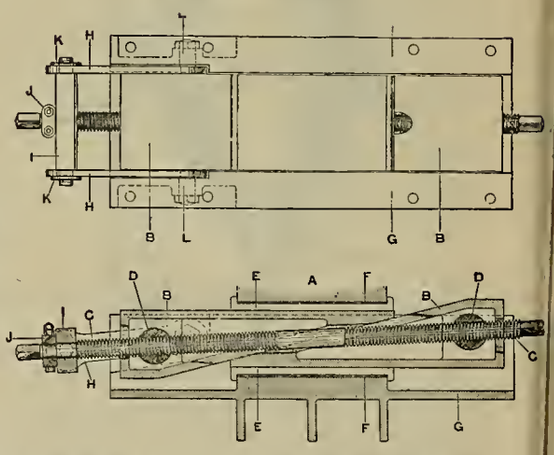
A LIQUID that will not freeze at a temperature of 205° below zero is said to have been discovered by Dr. Arsene d'Arsonval of the French Academy of Sciences. The liquid is extracted from ordinary petroleum. It is a "petroleum ether," and its temperature of freezing is lower than liquid air. The inventor says it is destined to be of considerable value to scientists, especially in chemical research, permitting the construction of thermometers of great range and precision.

PETROLEUM, it is claimed, can be deprived of its odor by adding to it about 2% of chlorite of lime, and stirring thoroughly for a long time. The mass is then stirred up with unslacked lime and allowed to stand. The petroleum will then have no offensive odor and can be decanted off from the calcareous sediment.

The American Steam Stamp.

It is not to be expected that a small simple engine will realize the same economy of steam as can be obtained in a 2000 H. P. steam plant with triple expansion engines and all the expense of details involved in a great installation. But the small engine serves an excellent purpose. It is not to be expected that a small prospecting mill costing a few hundred dollars will be as economical in power and labor costs per ton of ore crushed as an Alaska-Treadwell mill costing hundreds of thousands of dollars. The man who complained that he could get for a sixpence in his country what cost him a shilling here, was asked why he did not stay there and enjoy this economy, but explained that he had no sixpences.

If the owner of a gold mining prospect has not got the hundreds of thousands necessary for a great mining plant and development; if he cannot safely pay interest on these great sums for months and years until his mine reimburses him, he has the alternative of taking more modest steps, putting in a small reduction plant, developing his property by degrees and realizing from the mine itself to pay for its advancement to greater things. The



manufacturers say: "The American steam stamp is designed to meet the requirements of the owners of gold mining prospects and small mines. For the adjustment necessary to compensate for wear of shoes and dies this stamp employs a wedge base with right and left hand screw. This combines the power of wedge and screw, can be worked by a hand ratchet, and does not disturb the steam valve mechanism at all. For the steam valve this type of mill is equipped with the steam hammer valve, which will stand years of hard usage and continue as reliable as at first. These two features do not require any skilled attention. The possibility of grease getting into the mortar is guarded against by the construction, and there is no other point liable to give trouble under unskilled handling."

The capacity of the single stamp is large. The feeder is a familiar and reliable attachment. The number and force of blows can be set so as to obtain the best pulverizing result on the ore. Changes can, so the manufacturers claim, be made while the machine is running, and the stamp can be left to pound ore with only occasional attention. The mill requires only a small foundation, a boiler, and a shed for covering it. The accompanying cuts give a side view of the stamp mill, and a section showing the wood base adjustment for taking up shoes and dies. A machine is set up in action at the works of the manufacturers, the American Engineering Works, Chicago, Ill.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

Stamp mills are in operation or under construction in quartz mines of Alaska as follows: Windham Bay, 10 stamps; Sumdum, 15 stamps; Snettisham, 25 stamps; Sheep Creek, 30 stamps; Ready Bullion mine, 120 stamps; Mexican mine, 120 stamps; Union mine, 100 stamps; Alaska-Treadwell mine, the largest mill in the world, 540 stamps; Ebner G. M. Co., 15 stamps and 25 under construction; Nowell Co., 10 stamps; Silver Bow Basin hydraulic mine, Alaska-Juneau C. M. Co., 35 stamps; Perseverance M. Co., making preparations for 200 stamps; Rodman Bay, 200 stamps; Yankee Cove mine, 5 stamps; Borners Bay mines, 35 stamps; Seward City, 70 stamps; Funter Bay mines, 10 stamps: Sea Level, 30 stamps under construction; sundry small mines constructing an aggregate of 205 stamps. Total number of stamps, 1800.

KETCHIKAN.

The Wales C. M. Co. of Tacoma, Wash., R. M. Mountfort president, L. M. Glidden secretary, and G. W. Boggs manager, owns a group of five claims near Kassan bay, Prince of Wales Island, which it has been developing. It is claimed that the ore body on the surface is nearly 150 feet in width, and it is estimated averages 4.81% copper, $1.20 gold and 87 cents silver. It contains shoots of high-grade ore, assays from which show values from $26.76 to $83.12, with gold from $6.40 to $21 per ton.

S. Lichtenstadter of Ketchikan is driving 200 feet of tunnel on the Constitution group, Prince of Wales Island. The construction of a tramway 14 miles long between the mine and the head of Karta bay is under consideration.

YUKON.

It is reported from Porcupine, Alaska, that the camp is deserted, nearly every man in the place having left for the new diggings on Frazier creek, 75 miles from Porcupine on the Dalton trail.

Reports said to be responsible say quartz conglomerates have been discovered on Indian river, 28 miles from Dawson, rich in gold and in large bodies. Indian river and tributary creeks were thoroughly prospected for placer gold in the early days of the Klondike rush. Recently the nature of the placer material on these creeks is said to have attracted the attention of miners who had worked in the Transvaal, and impressed with its similarity to the rich "blanket" deposits of the Rand, they carried their investigations to the benches, and discovered that the escarpments of the Indian River valley were composed of immense masses of conglomerates which they found were gold bearing and at various points carried from $100 to $200 in gold to the ton. The conglomerate deposit so far located is 8 miles long and from 1¼ to 4 miles wide. Its thickness is unknown as yet.

ARIZONA.

COCHISE COUNTY.

The Calumet & Arizona Co. has bought four mining claims at Bisbee of M. Brophy and M. O'Hare for $190,000—10% of which was paid down—and five claims from Shattuck & Letson for $85,000. Work on these claims has been begun. The mines are named the Calumet & Pittsburg.

GILA COUNTY.

The Crenshaw Bros. of New York, Baltimore, Md., and Richmond, Va., own the controlling interest in the Mercer Tunnel property near Globe, with W. H. Mercer and J. A. Valentine. Mr. Mercer, the Supt., states that preliminary work on the tunnel has been commenced. The property to be developed by this tunnel consists of twenty-one claims, covering over 400 acres of ground, situated on the divide between Pinto and Mineral creeks. The tunnel will be 2000 feet long, cutting about thirty copper-bearing veins that show on the surface, and the face of the tunnel when completed will be between 1200 and 1400 feet deep. The driving of the tunnel will be let by contract, and it will be sufficiently large to admit of the use of electric or steam motors.

W. N. Bowen of St. Joseph, Mo., vice-president of the Pinto Creek M. & S. Co., is visiting the company's mines on Pinto creek. Supt. L. M. Teal has sunk the shaft on the Yo Tambien about 75 feet, giving a total depth of nearly 325 feet, and the drift from the 250-foot level has been continued about 60 feet in ore.

MOHAVE COUNTY.

J. M. Murphy of Kingman says returns from a carload of ore from the Payroll mine, Chloride, show 15 ounces silver, 1.75 ounces gold and 40% lead to the ton.

The mines located by R. M. Bryan and associates near Yavapai carry gold and coppor and occur in lime formation. Assays from the properties are claimed to show two ounces in gold with a small percentage of copper.

YAVAPAI COUNTY.

The Revenue group of mines near Congress, owned by the King Solomon M. Co. of Lima, O., is located upon a gold-bearing ledge from 4 to 6 feet in width upon the surface. The development work on the Revenue mines is in charge of W. L. Hardin. It is the intention of the company to install a stamp mill and cyanide plant later on.

The Black Rock G. & C. M. Co. of Coconino is developing a group of mines near Dewey, with W. D. Powell as Supt.

CALIFORNIA.

AMADOR COUNTY.

The Bay State mine near Plymouth has resumed operations under a bond and ten men are employed in its exploration. It is reported that the work of prospecting the result is satisfactory C. Sweeney and associates will at once put on a large force will only continue for a few months and if of men. John Ross Jr. of Sutter Creek is superintendent.

The Central Eureka mine is making an addition of ten stamps to its mill, which will make twenty stamps in all. The addition will take a month to complete.

BUTTE COUNTY.

The Lava Bed Dredging Co., Mr. Marsh Supt., finding that a large amount of dirt will have to be moved in order to get at the dredging ground, have put a steam shovel at work to move it. The big steam shovel was taken from the railroad to the mine on a track laid through Oroville streets. The track was laid in short three-rail-length sections, which were taken up and moved ahead after the shovel had passed over them.

H. P. Stow, manager of the Gold Bank mine at Forbestown, states that the lowest tunnel had been driven ahead about 1000 feet to what is known as the "Church Ledge." From this point drifting is being done and several quartz "stringers" have been encountered, all carrying gold. The Church or "back" ledge is parallel to the Gold Bank and distant on the surface about 900 feet. The point where it is reached by the tunnel is 2400 feet below the croppings on the incline.

EL DORADO COUNTY.

The Horseshoe Flat mine, at Newtown, is a placer mine in the channel of which a shaft is being sunk. A depth of 315 feet on the incline has been reached. The company operating this mine is composed of the Potts Bros., T. Smith, I. W. Dickinson and S. Maginess of Placerville.

KERN COUNTY.

A consolidation has been made of the Red Dog mill and the Stanford, Gold Coin and other claims, all at Randsburg. The Gold Coin people will hereafter run the mill.

MARIPOSA COUNTY.

D. W. McCarthy of the Columbus mine, near Mariposa, says his company has expended $30,000 in development work in the past three years and has on hand a large quantity of pay ore. One tunnel of the consolidated claims is in 1450 feet. J. W. McCarthy of Stockton is president of the company.

The Mary Harrison mine at Coulterville has had installed a new gallows-frame on the shaft and the milling of ore has been commenced. The mill is situated about 3 miles distant from the mine and is of forty stamps. The ore is hauled from the mine to the mill by a steam railway.

NEVADA COUNTY.

The Blue Tent and Enterprise claims, located at Blue Tent, have been bonded by C. L. Canfield and Eastern people, who propose to run a tunnel to tap the channel. When pay gravel is reached a 20-stamp mill will be erected. C. L. Canfield is also interested in the Bellfountaine mine, near Nevada City, and the new gravel mine at Shady creek. At the latter place headway is being made in getting ready to work in virgin ground. C. Graham is Supt. and C. Wodell is foreman.

A. T. Hall of the Grizzly Hill mine, near Nevada City, says it is the intention of the company to put in more gravel crushers in the spring.

It is reported that the Murchie mine at Nevada City has been bonded to J. C. Campbell of that place. The mine is owned by San Francisco people and embraces several ledges, varying in width from a few inches to 15 feet. The greatest depth reached is 700 feet. The ledges are in granite, the ore averaging of fair grade and being well charged with high-grade sulphurets.

Good progress is being made by Supt. Mallen in sinking the shaft from the 1200-foot level at the Brunswick mine near Nevada City. It is now down 137 feet below that level and headed for the ledge.

A San Francisco corporation has been formed to work the Minnie Bell, Alice and Stemwinder claims at Fronch Corral. The new company state that they intend to erect a mill which will have a crushing capacity of from 100 to 150 tons daily.

The Empire mine at Grass Valley has added a large air compressor to its plant. It has a capacity to supply air to thirty drills and is the largest single air compressor in Nevada county. Supt. Starr is excavating foundations for it.

Manager Starr of the Empire mine at Grass Valley says the company will soon add 20 stamps to the present mill of 40 stamps.

PLACER COUNTY.

E. Dugger, N. Collins, W. Atwell and B. Horton are developing a gravel claim in Secret canyon, 5 miles east of Colfax.

The Tadpole Con. G. M. Co. have begun work at their mine near Westville. The company expect to reach pay gravel with 100 feet advance of the tunnel.

Five new quartz mills were built in Placer county in 1901, as follows: Washington mine, near Forest Hill, 20-stamp mill; Three Stars mine, Ophir, 20-stamp mill; Rawhide mine, near Towle, 10-stamp mill; Central mine, near Damascus, 10-stamp mill to replace old mill; Shady Run mine, near Towle, 10-stamp mill.

SAN BERNARDINO COUNTY.

A rich strike of copper and gold is reported made south of Klinefolter, 12 miles from Needles, by T. Cotter and F. Robie. They have a 4-foot shaft down 38 feet and are reported to be working in a solid body of ore that runs 5% pure copper and $12 gold to the ton.

G. Zwanzig has made a discovery of soda niter near Newbury. The deposit is claimed to extend through 2000 acres of land. Tests are stated to show from a trace to 10% of niter in the beds.

SHASTA COUNTY.

Evans & Dougherty shipped one car of sixty tons of chromite from their mine at Dunsmuir to the smelters, to be used for furnace hearth lining. The buyers require that the pieces of chrome ore must not be smaller than a man's head. They pay $15 a ton f. o. b. Chromite for furnace purposes must carry 40% of chromic acid to be acceptable.

A gold mine has been discovered on the old county hospital land near Shasta, eighty acres of which land were sold to local people for $600. They have developed a quartz claim on the property and at a depth of 60 feet have found rock that is rich in free gold, which is easily discernible to the naked eye. The pay shoot is 3 feet in width.

It is reported that a large vein of high grade ore had been struck by the lowest tunnel in the Bully Hill mine at De Lamar.

The Arps group at Copper City, bonded to F. H. Hall, has been started up with F. Sletcher as Supt. Some road work has been completed and buildings constructed.

SIERRA COUNTY.

J. W. Morrell, Supt., of San Francisco has commenced work on the Balsam Flat gravel mine, near Alleghany, and is running a 1200-foot tunnel to open the gravel channel.

SISKIYOU COUNTY.

The Sheba Mine on Patterson creek, near Fort Jones, is working twenty men, who keep the 10-stamp mill supplied with ore.

The owners of the Drummer Boy have concluded to erect a 5-stamp mill at their mine on Cherry Creek, near Fort Jones.

Whip & Poole of Colorado have bonded the Empire Bar mine on Klamath river, near Yreka, at $6500. The claim is owned by D. McCarthy, J. Garvey, R. S. Taylor and J. F. Lodge.

TUOLUMNE COUNTY.

In the Jubilee group of mines, above Sonora, development is progressing on several claims. In the Purdy 175 feet has been drifted on a 2-foot vein of ore. The Evans claim is yielding considerable ore and a new shoot has been struck.

Supt. A. W. Bryant of the Prudhomme mine, near Carters, says that work continues on the rich vein uncovered recently at the 200-foot level, and the contract has been let to sink the shaft another 100 feet.

D. Pennington and others, owners of the Blue Star and the White Star mines, near Carters, drifted 250 feet along the vein in the claims, exposing a large body of ore. A mill test of eight tons showed a value of $11.50 per ton. The average width between walls is 6 feet—all milling ore.

The Star mine at Columbia has resumed operations after being closed several years. The Rose Creek M. Co., owning the mine, has bonded the mine to E. A. and J. O. Hayes of San Jose.

Very rich ore has been struck by F. Plummer and J. Purcell in a claim near Sonora. It is both milling and pocket in character. It is the intention of the owners to erect a 3-stamp mill immediately.

Manager Dron has completed the repairs on the Nonpareil mine at Big Oak Flat and pumping operations have been resumed.

The Hull mine, near Groveland, has been bonded to C. Y. De Lay. Considerable work has been done on the property and a ledge of high-grade ore opened up.

The Independent mine at Soulsbyville has been started up by a Colorado company. Mr. De Masters is the Supt. The mine has lain idle for a number of years. It is the property of T. Wost, W. Sharwood and Mrs. Curnow of Sonora.

J. Ferguson and W. Richards have bonded their quartz claim, situated on Turnback creek, near Sonora, to San Francisco and Michigan men, who have contracted to begin work within sixty days and to erect a 20-stamp mill within six months. The mine is a tunnel proposition.

COLORADO.

BOULDER COUNTY.

The Golden Eagle group of mines, consisting of the Golden Eagle, Golden Eagle No. 2, Golden Eagle Extension and the Dorchester, at Wall Street, is being equipped with a complete outfit of machinery sufficiently powerful to go down 1000 feet. J. T. Fitzgerald of Boulder is manager and J. P. Clark Supt.

The shaft on the Melvina mine at Wall Street is down over 700 feet. The ore in the Melvina is running close to $200 for general ore, with some going $640 per ton and small lots going as high as $22 per pound. The mine is owned by the Great Eastern Co. of Boston, Mass., which bought it for $150,000.

CLEAR CREEK COUNTY.

The Two Sisters M., M. & T. Co. has been incorporated to operate the American Sisters mine at Silver Creek. The incorporators are W. A. Williams, J. J. White, W. A. Pollock, E. S. Nash and F. L. Burton. The principal office will be at Lawton, with F. L. Burton manager. It is proposed to run a tunnel from Lawson 1800 feet in to the vein, opening it, together with other valuable lodes. The tunnel is to be 8x12 feet in the clear and will carry two tracks.

The Franklin Con. Co. have taken up their option on the Wilkie mill and transferred the mill to the Wilkie Milling Co., who are making improvements to it. They will add new jigs, screens, crushers and Bartlett and Wilfley tables. Later they project the building of a tramway from the mouth of the Newhouse tunnel to the mill. G. S. Wilkie, the former owner, is mill Supt.

GILPIN COUNTY.

The Saratoga mine, near Russell, has put in a new air compressor for the sinking of the shaft to connect with the Newhouse tunnel. The tunnel will cut the Saratoga mine during the summer, when a raise will be made to connect with the shaft.

The Beacon of the West mine, Russell district, is being worked under lease and bond by A. B. Berger, with W. G. Martin superintendent. The last lot of smelting ore from this property gave values of about fifty ounces gold per ton. The property is owned by H. Sayr of Denver, and the operators may decide on putting up a hoisting plant of machinery at an early date.

The British property near Lake has been started up under lease by New York people, with E. P. Thomas superintendent. The 170-foot or bottom levels are being cleaned out. Mr. Thomas says they may put up a steam hoisting plant and carry on heavier operations. This main shaft is only 180 feet deep.

Lowrey & Co. of Russell have a lease and bond on the Hayes & Wheeler mine, and have taken the water out. The shaft is about 160 feet deep, and the lessees are figuring on sinking. A whip is being used for hoisting, which may be replaced by a steam plant at an early date.

HINSDALE COUNTY.

The operations in the Golden Fleece mine, near Lake City, are expected to recover the lost ore vein, and it is now thought to have been already found 800 feet below where worked formerly. The values now found in the tunnel are in petzite ore, a combination of tellurium, gold and silver. The petzite contains about 40% silver, 16% gold and the rest tellurium. A plant will be built at the mouth of the long tunnel to have a capacity of 150 tons per day.

LAKE COUNTY.

The Homestake mine at Leadville is producing ore running from 50 to 100 ounces silver besides good values in gold, lead and copper. Since October more than 650 tons have been shipped.

Operations on the Moyer shaft of the

Iron Silver mine at Leadville are yielding 200 tons of ore a day. One of the peculiarities of the zinc sulphide in the Moyer is that $2 and $3 gold to the ton is found.

It is reported that operations on the Triumph mine at Leadville will he resumed. The Triumph is located on the gold belt.

MINERAL COUNTY.

A home mining company is being organized at Creede to operate a portion of the Bachelor mine laying helow the Nelson tunnel level.

For January to the 18th inst. the ore shipments from Creede were 3106 tons. The track throughout the Nelson and Humphreys tunnels is to he made a 2-foot gauge. It is now 18 inches. The length of the two tunnels is about 10,000 feet.

OURAY COUNTY.

The Camp Bird Extension M. Co., according to the annual report of the president, has the main tunnel on the mine at Ouray in 950 feet, with 700 feet of it in ore. An electric drill has been installed. The stockholders have adopted plans for a 100-ton milling plant construction to be commenced immediately. At the annual meeting in Denver J. H. Rohin was elected president; F. J. Campbell, secretary.

SAN MIGUEL COUNTY.

The Smuggler-Union Co. at Telluride has resumed operations in every department. The huildings destroyed by the fire of Novemher 20 last have been reconstructed, the tram is hringing down 450 tons of ore a day, the mill is turning out three to four carloads of concentrates every twenty-four hours, and 430 men are on the pay roll. At the Contention mine, which also is owned by the Smuggler Co., ahout eighty men are employed and the tramway is steadily supplying ore to thirty stamps in the old mill at Pandora.

The Boston Exploration Co. has voted to take the Japan mines, near Telluride, which have heen under examination hy their engineers for the past three months. The property comprises twenty claims and lies between the Smuggler-Union and Tom Boy mines.

SUMMIT COUNTY.

The Mountain Pride mine, on Mount Baldy, near Breckenridge, is developed by a shaft and tunnel to a depth of 350 feet, and is equipped with pumps, mill and other machinery. The Mountain Pride G. M. Co. of Denver has been organized to buy the property. J. W. Gates of Chicago ls the present owner. C. A. Finding is manager.

TELLER COUNTY.

The total of dividends of Cripple Creek mines for January is $394,650. The companies declaring dividends, and the amounts, are as follows: Portland, $180,000; Vindicator, $88,000; Mary McKinney, $30,000; Gold Coin, $30,000; Union, $25,000; Consolidated, $19,000; Strong, $25,000; New Zealand, $7650; total, $394,650.

IDAHO.

ADA COUNTY.

The Pay Day M. Co. has been incorporated, capital $300,000, with J. W. Cage president, E. G. Hurt secretary and A. L. Morris manager. The property is situated near Neal and is now being developed.

SHOSHONE COUNTY.

The metal production of Idaho for 1901 is estimated to be a gross value of $18,000,000, of which total the mines of the Cœur d'Alenes produced gross values as follows:

Bunker Hill	$2,000,000
Standard	1,500,000
Morning	1,500,000
Empire State	1,350,000
Tiger-Poorman	900,000
Mammoth	900,000
Frisco	465,000
Hunter	375,000
Hecla	186,000
Crown Point	186,000
North Side (Gold Belt)	138,000
Total	$9,500,000

IDAHO COUNTY.

The Mammoth and Great Eastern claims at Dixie, owned hy the company of that name, have ahout 800 feet of development work done and ore blocked out which, it is claimed, will assay more than $6 per ton. A 10-stamp mill is projected to he installed upon the property during the coming summer.

T. Hye, Supt. and general manager of the Dixie Queen mine and mill in Dixie, says the new 10-stamp mill on the Dixie Queen has heen working steadily since Decemher 10 and handling 40 to 45 tons of ore daily. Of the ores run through the mill so far, he says, 60% to 65% of the values is saved on plates and total values up to 95% and 97% are saved with concentration.

The Idaho Comstock mine, at Dixie, is to have, it is reported, the four stamps of its mill increased to twenty.

MICHIGAN.

HOUGHTON COUNTY.

On January 1st the approximate depths of the Quincy shafts were: No. 2, 4850 feet; No. 4, 4200 feet; No. 6, 4800 feet; No. 7, 4460 feet; No. 8, 1300 feet. The mill is stampIng 3100 tons of rock daily, yielding an average of 1⅛% mineral. Twenty-four per cent of the Quincy product is mass and harrel copper. The electrical system of tramming tested for two weeks gives satisfactory results, especially where trams are long, and further appliances of this kind will be installed.

MONTANA.

FLATHEAD COUNTY.

D. P. Bowers, manager of the Snowshoe mine, near Libby, is attempting to get all the mine owners in the Libby district to unite in estahlishing a telephone line to each of the properties where any work is now being carried on, and to make Lihby the central office for the system.

A strike is reported to have been made in the mine of the Northern Montana G. M. Co., in the West Fisher district, near Libby. A vein of rich free-milling ore 4½ feet wide has heen found in the tunnel, which is now in 105 feet.

M. J. Brick, one of the owners of the Fisher Creek M. Co.'s property near Lihhy, says that it is the intention of the company to put in ten additional stamps, which will give twenty stamps. The necessary machinery, including the water wheel, he states, is now on the ground, and the excavation and foundation have been completed.

JEFFERSON COUNTY.

The Vautour mine, near Basin, is to be developed to depth hy Tallant & Petersou, who have leased it from Beattie Bros. They have installed a steam hoist and started to sink to the 300-foot level, where they will crosscut to the vein.

The Bismarck mine, near Sheridan, is shipping ore from development work, which will be carried on during the remainder of the winter, and a concentrator will be commenced in the spring.

MADISON COUNTY.

C. Austin, manager of the Red Bluff G. M. Co., Ltd , at Red Bluff, states that the work of draining and operation of the Red Bluff mine, suspended for several months, has been resumed.

Rich gold finds are reported as being made in the west end of the Norwegian district, about 25 miles from Pony. Ahout thirty claims have already heen located and there are many prospectors. It is stated that one man with a team and wagon can make $25 a day picking up the quartz float carrying gold found on the surface. The lode from which the float has come is reported to have heen found.

J. Harkins is developing the Blue Jay mine on Kern gulch, near Virginia City. The shaft is 85 feet deep. The ore carries gold, silver and copper.

A 42-pound gold nugget, worth upward of $10,000, is reported to have been found in California Gulch, one of the tributaries of Alder Gulch. The nugget is said to be the largest of the three found at the same time by T. Ramon and J. Lefebre.

NEVADA.

DOUGLAS COUNTY.

G. Lamy of Gardnerville and associates propose to put in a power plant on the main fork of the Carson river to furnish Gardnerville with lights and to supply cheap power for industrial plants in Carson valley.

LINCOLN COUNTY.

S. E. Yount of Goodsprings reports that a new find of ore has been made ahout 4 miles northwest of Goodsprings, on the spur of Potosi mountain, Yellow Pine district, by J. C. Armstrong and J. D. Loop of Goodsprings. The discovery is of cinnabar carrying a high value in gold. The veins are on the contact of porphyry and lime. Everyone in that locality heretofore supposed that the "red cast" of the outcrop veins was iron, and they were supposed to he valueless, since the ore would not horn any free gold.

LYON COUNTY.

Kennedy & Boehme, lately from Tonopah, have leased a claim in Silver City owned by F. Golden. There is a tunnel on the property and a shaft 200 feet deep is to he sunk. There is said to he a ledge of $10 ore in the mine.

The Heather M. & R. Co. has heen organized in Dayton hy Davis & Gignoux to work several large deposits of tailings in Six Mile canyon. The company has hought the Harris Blood cyanide plant and has a large number of men employed.

STOREY COUNTY.

The Con. Cal. & Va. M. Co. has sold its ore tailings, ahout 2000 tons, at Virginia City, to J. P. Woodhury, who proposes to erect a plant on the spot for working them.

The Mammoth G. & S. M. Co. has been incorporated at Virginia City. The trustees are P. J. Keyes, M. J. Kernan, W. H. Hancock, W. V. Ryan and J. J. Quinlan; capital stock $100,000.

WASHOE COUNTY.

Hot water has been struck in the Reno Star mine at Wedekind City at a depth of about 130 feet.

A steam hoist for the Colorado-Nevada M. Co. is being set up on its mine near Wedekind City. There are now four steam hoists in a lot of land not over 100 yards square. The gold and silver production of Wedekind is now nearly a thousand dollars a day.

WHITE PINE COUNTY.

The New York & Nevada Copper Co. has been incorporated in New Jersey to operate the Copper Flat properties at Ely.

NEW MEXICO.

BERNALILLO COUNTY.

The Golden Cochiti Tunnel Co. has driven its tunnel at Bland over 800 feet. The tunnel will pass at 1350 feet depth through the Washington mine. Its projected length is 8000 feet.

GRANT COUNTY.

(Special Correspondence): The Lena M. Co., of which J. C. Carrero is manager, is erecting a 150-ton concentrating plant at Lordsburg, to treat ores from their own mine. The mill has crushers, elevators, rolls, Huntington grinders, amalgamating plates, Wilfley and Bartlett tahles and settling tanks. The ores carry gold, silver and copper.

Lordsburg, N. M., Jan. 22.

Work on the Sampson mine at Burros has been suspended while a 50-ton concentrating mill is being constructed. The ore of the mine, it is claimed, can be handled with a profit with copper down to 8 cents a pound.

The Michigan-New Mexico C. Co. ls operating at Burros and Lordsburg. The copper ore runs about 10% copper, with a few dollars of gold and silver per ton.

LINCOLN COUNTY.

A new gold camp has been established on the south fork of Benito creek. Ore has been found that averages $200 to the ton.

G. Dilliard and C. Brown of Nogal have made a rich gold strike on the South Fork of Bonito creek. The rock is said to be a perfect network of gold wire, some of it as thick as ordinary thread. A. R. Byrd, the day of the find, it is reported, bought the claim for $10,000.

G. H. Fuller of Chicago, Ill., has eighty-four mining claims at Parsons. The Eagle Creek M. Co. has heen organized to work these claims and, it is stated, proposes to spend ahout $700,000 in development work. A dam 100 feet high is to be constructed across the Bonito river. It will he 250 feet long and will be built of concrete The ore is to he worked with the cyanide process. As soon as the dam is completed machinery will be installed and shafts sunk. It is expected to handle 500 tons of ore a day.

J. M. Bryson has sold a group of claims at Estey City to New England people and has put twenty-two men on development operations on other claims retained hy him. The ore hody is over 40 feet wide and the assays show values of over $30 per ton.

LUNA COUNTY.

J. A. McCoy of Boston, Mass., is in charge of the mines of the Golden Cross & Eagle M. Co. near Carlzllilo, preparing for the resumption of operations. Boston, Mass., and Terre Haute and New Albany, Ind., capital is interested.

OTERO COUNTY.

E. M. Skeats of El Paso, Texas, has been examining the property of the Calaveras M. Association near Alamogordo. The company propose to install steam drills and erect a concentrating plant for the lead ores of the mines.

SOCORRO COUNTY.

Two hoists and other machinery are being placed in the caves near Lava, out of which guano is being mined. The 50 men employed are to he increased to 150 men. Teams are used in hauling the guano to the railroad. In addition to the guano, deposits of phosphate are heing mined. J. M. Reynolds is superintendent.

OREGON.

GRANT COUNTY.

J. P. Linstrome of the Climax mine at Granite, owned hy Spokane, Wash., people, states that the company is soon to start a working tunnel on the cross vein, which will cut the other veins in the property and will tap the last ore hody when in ahout 900 feet.

JACKSON COUNTY.

J. Broad and T. Reid, owners of the Oregon Belle in Forest Creek district, near Jacksonville, are running their mill steadily and crushing hetween sixty and seventy tons of ore every month. They report over $1400 worth of hullion, the result of a three-weeks run.

A strike has been made at Ashland in the main shaft in the Ashland mine at Ashland helow the 800-foot level. Drifting is being done on the 800-foot level and ore is being stoped from the 600-foot and 700-foot levels. The regular crew of thirty men is employed on this property.

A contract has been let by J. K. Reader to drive a 250-foot tunnel on his mine near Ashland, which will open the ledge about 100 feet below the present workings.

JOSEPHINE COUNTY.

A ledge is heing developed in the Foots Creek district hy H. A. Reed and C. C. Daniels which shows a width on the surface of 25 to 50 feet, carrying values of $4 to $6 per ton in free gold.

UTAH.

BEAVER COUNTY.

The King Bird Con. M. Co. has heen incorporated, capital $500,000, with F. Tiernan, president and R. S. Tiernan secretary and treasurer, with office at Salt Lake City. The company owns the Silver Reef, Anaconda, Yu I, Three Way, King Bird and Chicago Traction claims in the Beaver Lake district.

The shaft on the Blackhird mine in Copper Gulch, near Milford, is down 50 feet. The work is so planned that there will be no hoisting until a depth of 107 feet is attained. An old prospect tunnel has been driven in to a point beneath the shaft and 107 feet from the surface. An upraise connects the face of this tunnel with the bottom of the shaft 50 feet from the surface. All of the rock will now be shot down this upraise and out through the tunnel, greatly expediting the work. Each set of timbers in this shaft oontains 1250 feet of lumher, not counting the lagging. The timhering alone will cost between $6 and $7 per foot. It is estimated that the total cost of sinking the shaft 1000 feet will be over $40 per foot.

BOX ELDER COUNTY.

The Dana G. M. & M. Co. has been incorporated, capital $250,000, with office at Salt Lake City. J. Dederich is president and J. J. Burke secretary. The company owns the Blue Jay, Constellation, Franklin, Iola, Atlanta, Dana, Gollath, Joliet and Baxter claims in Park valley.

SUMMIT COUNTY.

The West Ontario M. Co. of Philadelphia, Pa., has been incorporated, capital $25,000, to buy or lease mines at Park City. P. L. Williams of Park City is Utah representative for the company.

WEBER COUNTY.

The Kenneth M. Co. has heen incorporated, capital $28,000, with office at Ogden. W. N. Pierce is president and F. M. Farrell secretary and treasurer. The company will develop a mine in the Willard Hill district.

WASHINGTON.

OKANOGAN COUNTY.

Manager G. L. Hedges of the Wauconda G. M. Co., at Wauconda, says the large cross tunnel has been advanced 776 feet durlng 1901, making it 1028 feet from portal to face. This tunnel is 5½x7 feet ln the clear. Three large ledges and several small ones have heen cut by the tunnel. The tunnel is being pushed with a view of cutting two others. The work is heing prosecuted with three eight-hour shifts and an average advance is made of about 5 feet daily.

S. T. Langley of Rossland, B. C., has discovered the lost gold ledge of the Okanogan mine, now the Oroville, near Wauconda. The property comprises a 4-foot ledge of free-gold ore, carrying values of $40 to $42 per ton. A 10-stamp mill was erected and 5000 feet of development work was done in 1898, when the vein was lost.

FOREIGN.

BRITISH COLUMBIA.

E. D. Sanders of Spokane, Wash., of the Sullivan Group M. Co., in East Kootenay, says that his company intends, on the completion of its smelter and lead refinery at Marysville, to add a lead corroding works for the purpose of manufacturing white lead. "What is the use," Mr. Sanders is reported as saying, "of selling our lead for 1.2 cents per pound, when we can take the hullion and refine it into pig lead, take the pig lead and corrode it into white lead and get 5 cents per pound for it?"

The Last Chance M. Co., which is controlled hy Los Angeles, Cal., people, has made an important strike in the Last Chance mine near Sandon. The company has completed an 1800-foot tunnel at a cost of $50,000 and has struck the ore vein at a depth of 1600 feet below the surface, making, it is stated, the deepest mine opening in the Northwest. The ore continues of a high grade, running 130 ounces silver and 65% lead, this proportion be-

tween the two minerals being nearly uniform throughout the mine. J. Stinson of Los Angeles, Cal., the S. McDonald estate and B. Wilson of Victoria are large stockholders.

From Vancouver and New Westminster hundreds of men—miners, business men and clerks—are stampeding to new placer fields discovered at Sumas, near the international line, about 50 miles from Vancouver. The discovery was made by William Davis. The location is on an alluvial flat, a former bed of the Fraser river. Out of the one hole Davis took $10 worth of gold.

Wm. F. Robinson, Provisional Mineralogist of British Columbia, says of the mineral production of that Province, that: "Roughly speaking, the increase made in 1901 over 1900 is 25% on gross values of output of the Province. There is an appreciable drop in the placer gold production, owing to the sudden melting of the snow last spring causing freshets and leaving a shortage of water during the latter part of the season. The tonnage of ore mined from the lode mines in the past is about 871,832 tons, equal to an increase of 317,036 over the year 1900, a little more than 57%. There has been an increase in the output of all the metals with the exception of lead, the low price obtainable in this Province for lead ores having discouraged this class of mining, except where accompanied with good silver values. The gross value of the copper output has increased 206% over 1900, while lode gold has increased 36% and silver 14%." The comparative values of the principal mineral products are as follows:

	1900.	(Estimated). 1901.
Gold, placer	$1,278,724	$ 892,500
Gold, lode	3,453,381	4,704,200
Silver	2,309,200	2,624,002
Copper	1,615,289	4,951,698
Lead	2,691,887	1,970,641
Coal	4,318,785	4,587,630
Coke	425,745	637,800
Other materials	251,740	309,030
Totals	$16,344,751	$20,677,501

The Tyee M. Co. has ordered the plant and equipment for a smelter at Ladysmith, Vancouver island, and a tender has been accepted for an aerial tramway to carry the ore to the smelter. Work is to be commenced within two months.

At the Rambler-Cariboo mine, Nelson district, the main shaft is 270 feet below the third level, giving a total vertical depth of 770 feet. The concentrator at the mine is complete and it is expected to start about March 1, treating 80 to 100 tons of ore daily. The intention is to sink the shaft 200 feet farther.

The output of Rossland mines for the week ending January 25 was 5860 tons, divided as follows: Le Roi, 4600 tons; Le Roi No. 2, 1200 tons; Cascade, 30 tons; Bonanza, 30 tons.

KLONDIKE.

A second stamp mill has been put in operation at Dawson, doubling the amount of quartz which can be handled daily. The new mill is owned by the Ladue G. M. Co. The mill handles ten tons daily. It has four stamps, weighing 850 pounds each. The striking feature of the advancement of the Klondike into actual existence as a quartz camp is the suddenness with which a vast amount of gold-bearing quartz has been offered for crushing. The Munger mill has been running steadily since it started, and the Ladue Co., it is reported, cannot begin to accept all the orders offered it. It is said that at least four similar mills more are needed to crush the quartz which mines now in operation can furnish.

A second bedrock on El Dorado creek, 30 feet beneath the first, is reported found. The gravel from it yields from $1 to $5 to the pan.

The receipts of royalty last year by the creek or districts in Yukon Territory were as follows:

Forty-Mile	$ 599 00
Eureka	391 00
Dominion	37,751 41
Sulphur	11,581 91
Gold Run	37,084 87
Hunker	36,526 86
Grand Forks, including Bonanza, El Dorado and numerous hillside and bench claims and gulches of the vicinity	249,211 81
Total	$381,162 89

The number of claims worked on a small scale during 1901 are said almost to have doubled over 1900, and since there have been so many small producers the output on the whole has been distributed among more owners and the royalty exemptions in the aggregate are large. The total export of gold this season, according to reports kept at the boundary, has been $16,304,682 75. No gold was allowed to be taken out unless accompanied by a certificate of export issued by the Government. These figures of the amount exported and the amount on which royalty was paid, when compared, show that half of the dust on record as exported was exempt from taxation.

MEXICO.

It is reported that R. E. Jennings, president of the Crucible Steel Works, and several officers of the United States Steel Co. have bought the Viceroy silver mines, situated in the Mapimi district of Mexico, for $1,000,000.

The railway of the Green Con. C. Co. connecting La Cananea, Sonora, with the American railway system at Naco, the terminus, upon the international boundary of the Naco branch of the El Paso & Southwestern Railway, has been completed into La Cananea, at a distance of 40 miles from Naco, and a regular freight and passenger traffic has been inaugurated.

It is reported that the La Calera Co., whose copper property is in Altar district, Sonora, has made plans to proceed at once with the erection of a $250,000 reduction plant and to construct a railroad from the mines to the Gulf of California coast.

NATAL.

An application has been made to the Commissioner of Mines of Natal for a license for dredging rights over Durban bay. The applicant is satisfied that the bay contains sufficient gold to make the venture pay well.

PERU.

It is reported that, in view of the heavy fall in the price of copper and in order to prevent the threatened closing of several copper mines in Peru, several trans-Atlantic steamship lines have lowered their freight rates on copper by 7 shillings per ton. Lima business men have requested the Central Railway to reduce the present rate on copper transportation from the mines to the coast.

Mr. Neill, Secretary of Legation at Lima, reports the formation of an American syndicate, with headquarters in New York, for taking over copper and other mines in Cerro de Pasco. The ores of this district, he reports, contain gold, silver, lead and copper. The amount of silver coined, smelted and exported from Peru from 1786 to 1850 was 285,613,796 ounces, of which 161,451,731 ounces were from Cerro de Pasco alone. The exportation of copper ores from Cerro de Pasco in 1900 was 11,944.2 metric tons, besides 5138 tons of copper bars. These ores, on being assayed, have given grades between 18% and 40%. A projected railroad will lower freight charges from $39 per ton when carried by llamas to about $11.66, and the price of coal from $24.85 per ton to about $3.88. The American syndicate owns five-sixths of this district, having 480 square miles. It is reported that another syndicate is being formed for the purpose of securing and working the rich copper mines in the Yauli district.

TRANSVAAL.

The Chamber of Mines of Johannesburg has issued a report showing that the output of the mines for December, 1901, was 52,897 ounces of fine gold, against 39,075 ounces for November.

Books Received.

"Register of Mines and Minerals, Lake county, Cal.," has been issued with a map by the California State Mining Bureau as one of a series of County Registers of mines which has been in preparation for several years. The mineral springs, of which there are seventy-five reported, are the special feature of the Lake County, Cal., Register.

"Cyanide Practice," by Alfred James, mining and metallurgical engineer, 8vo, 174 pages, illustrated. The author was the late technical manager of the original company introducing the cyanide process, and has an experience covering the entire period of the development of the process. The book is designed to be generally instructive of the process, its local modifications and apparatus, rather than minutely technical. It is largely a record of individual experience and not a compilation. It will be found instructive and useful to the constructing engineer of cyanide plants. Published by Engineering and Mining Journal, Incor., New York. Price, $5.

Trade Treatises.

FROM the John A. Roebling's Sons Co. of Trenton, N. J., comes a comprehensive catalogue of 76 pages, illustrating and describing in detail the many products of this old reliable house. The catalogue will be sent anywhere on request made to the home office, or to any of the branch offices located at 117 Liberty street, New York, 171 Lake street, Chicago, and 25 Fremont street, San Francisco, Cal.

Personal.

A. M. JOHNSON is manager of the Ophir M. Co. at Statoline, Utah.

E. CRAMER of Hailey, Idaho, is sojourning in Salt Lake City, Utah.

H. C. ROBINSON is exploring at Patani, in the Slamese-Malay States.

JOHN GLEESON has resigned as Supt. Copper Belle M. Co, Gleeson, Ariz.

C. J. KIMBALL is Supt. and David Kyle foreman, Union mine, Bradshaw, Ariz.

C. A. FINDING is manager of the Mountain Pride mine at Breckenridge, Colo.

J. HARKINS has resigned as foreman of the Alameda mine, near Virginia City, Mont.

BEN STANLEY REVETT expects to return from England to Breckenridge, Colo., next month.

JOHN GRAY is now Supt. Verde King M. Co., Arizona, with headquarters at Prescott, Ariz.

FREDERICK S. HARRIS has resumed the management of the Dorada mine, at Sonora, Mexico.

A. J. COLQUHOUN will have charge of the quicksilver mining development work at Savonas, B. C.

C. H. COLPE succeeds L. B. Doe in the management of the Jubilee M. Co.'s property, Sonora, Cal.

ROBT. MOORE of St. Louis, Mo., has been elected president American Society of Civil Engineers.

L. F. J. WRINKLE is surveying for a new cyanide plant at the old California mill, Virginia, Nev.

F. SLETCHER has been appointed Supt. of the Arps copper mine at Copper City, Shasta county, Cal.

WM. CARKEEK is drawing plans for the new 500-ton concentrator for the Shannon Co., Clifton, Arizona.

T. H. BARCLAY, former Supt. Elkhart mine, Chloride, Ariz., is now Supt. Hall Mines, Ltd., Nelson, B. C.

JOHN CARPENTER is the new foreman of the De Lamar C. M. & S. Co.'s Bully Hill mine, Winthrop, Cal.

W. MITCHELL has been appointed assistant manager at the Greene Con. M. Co. at Cananea, Sonora, Mexico.

J. L. BRYSON, Supt. of the Gold Crown mine at Omega, Nevada county, Cal., is sojourning in San Francisco.

EDWIN REYNOLDS of Milwaukee, Wis., has been elected president of the American Society of Mechanical Engineers.

F. GRIFFITH has resigned the management of the Red Dog mill, Johannesburg, Cal., being succeeded by Supt. Munn.

T. MCCABE, foreman of the Salt Lake & Tonopah M. Co. at Tonopah, Nev., has been appointed Supt. for the company.

ARTHUR HENDEY has gone from Jerome, Arizona, to Caborca, Sonora, Mexico, to test some placer properties there.

J. A. VAN LEUVEN, late assistant engineer with the U. S. Corps of Engineers at Havana, Cuba, has located at Redding, Cal.

J. D. GRAHAM, Gold Commissioner of Atlin, B. C., has returned from a sojourn at England to his home at Revelstoke, B. C.

L. M. COCKERILL is now manager United Mexican Mines Association, Ltd., at Guanajuato, Mex., succeeding R. H. Williams.

J. R. MORRISON of Nevada City is in San Francisco en route for Siberia. He will go there with A. S. Bigelow to engage in mining.

R. E. HANLEY, Supt. of the Copper King mine at Kennet, Cal., has resigned. It is understood that D. Muir will be Mr. Hanley's successor.

W. H. SEAMAN, of El Paso, Texas, has been appointed superintendent of the Copper Belle mines, at Gleeson, Arizona, succeeding John Gleeson, resigned.

COL. W. H. H. HEUER, U. S. Engineer Corps and senior member California Debris Commission, has returned to San Francisco from Nevada county, Cal.

CHAS. D. LANE and Messrs. Williams and Martin, who have been inspecting Silver Peak and Tonopah, Nev., properties, have returned to San Francisco.

F. C. SCHRADER of the U. S. Geological Survey sails for Valdez, Alaska, on the 15th inst. with eight assistants on an extended reconnoissance in the Copper river country.

ELBERT H. GARY, chairman of the board of directors of the United States Steel Corporation, has been elected chairman of the board of directors of the Allis-Chalmers Co.

GEO. H. EVANS, formerly general manager California Gold Mines Co, Oroville, Cal., now in the same capacity for the Gold Pan Dredging Co., Breckenridge, Colo., is visiting San Francisco, where he will sojourn during February. He is in charge of the most extensive enterprise of the kind in that country.

DUNCAN MCVICHIE has been elected general manager of the Bingham Con. M. Co. at Bingham, Utah, succeeding O. P. Posey, who retires to devote his entire time to his personal mining investments.

E. R. ABADIE is mentioned as the probable successor of Fred Zeltler as superintendent Champion Mining Co, Nevada Co., Cal, should that gentleman's proffered resignation be accepted by the directors.

JAMES HOWLISON, of Otago, N. Z, has been appointed general superintendent for the West African Dredging Syndicate, at an annual salary of $7500. The property of the syndicate includes 150 miles of river claims over which Mr. Howlison has jurisdiction.

W. J. LORING, formerly of the Utica mine, Angels, Cal., and later Supt. of Melones mine, Robinson, Cal., takes the general superintendency of a mine in Coolgardie, Australia, at an annual salary of $9000, leaving San Francisco, Cal., on the 6th inst.

E. E. OLCOTT of New York City for president; S. F. Emmons, Washington, D. C., Jas. Gayley, Pittsburg, Pa., J. H. Lee, Carbon Hill, Ala, for vice-presidents; E. W. Parker, New York City, Jas. W. Neill, Salt Lake City, Utah, M. D. Valentine, Woodbridge, N. J., for managers; T. D. Rand, Philadelphia, Pa., for treasurer, and R. W. Raymond of New York City for treasurer, are the names of the nominees for officers of the American Institute of Mining Engineers to be voted on at the eighty-second meeting of the Institute, the thirty second annual meeting in New York City on the 18th inst.

Commercial Paragraphs.

THE Giant Powder Co., 435 California street, San Francisco, Cal., will remove next week to their handsome new offices in the just completed Hayward building, northeast corner California and Montgomery streets, San Francisco, where they will occupy what are considered the most desirable offices in that section.

HEALD'S SCHOOL OF MINES, 24 Post street, San Francisco, Cal., is now under the direction of J. B. Balcomb. The scope of the school has been broadened and in addition to increased facilities of instruction the school will accept outside surveying, assaying and construction. A specialty is also made of coaching students in mathematics. Plans are about completed for moving into larger quarters.

THE New Process Raw Hide Co., Syracuse, N. Y., reports business as good at the opening of the new year. The company is in receipt of an order from the British Westinghouse Elec. & Mfg. Co. for sixty of its New Process noiseless pinions for the equipment of the British Company's new plant. These pinions are to be used on motors for driving machine tools, electric cranes, etc., and are for transmitting from 5 to 40 H. P. They write: "Orders from other sources are coming in fast and the outlook is promising for a good business year."

GEORGE E. WOODBURY, the concentrator manufacturer of 223 First street, San Francisco, Cal., has been appointed agent for the Wilfley concentrator. By a recent decision of the U. S. District Court the Wilfley patents have been sustained, shutting out concentrators of the table type. Mr. Woodbury has made an agreement with the Mine & Smelter Supply Co. of Denver Colo., which enables him to manufacture his Imperial tables. Both tables are favorably known to mining men. Mr. Woodbury says he "has a carload of machines on the road from Denver, but hereafter the machines will be built in San Francisco under my personal supervision. The best material will be used and no expense will be spared to keep up the present standard of this well-known table. We propose to protect our patent rights and will hold any person responsible attempting to infringe upon the same." Mr. Woodbury has the exclusive right of California, also the right of selling in any part of the United States.

OWING to the change in fuel conditions in the past two or three years, due to the oil discoveries in California, the Government decided some time ago to install a complete new boiler plant at Mare Island Navy Yard, opposite Vallejo, Cal., and the Government officials selected the Heine safety water tube boiler, manufactured by the Risdon Iron Works of San Francisco, Cal. The new plant will aggregate 500 H. P., and arrangements are being made so that another 500 H. P. boiler can be installed later. This is the boiler that made such a record at the Midwinter Fair at San Francisco in 1894. The Risdon Iron Works has recently made a number of large sales of these boilers, among which are for the new

building of the Mutual Savings Bank, the new plant of the Independent Light and Power Company, the St. Luke's Hospital and the San Francisco Gas and Electric Company, San Francisco. These boilers are claimed by the manufacturers to be peculiarly adapted for use by mining companies; that their construction enables them to be shipped in only moderately large pieces; that they can be put together at the mine and that they are peculiarly adapted for using impure water. They are used exclusively by the following large companies: Alaska-Treadwell, Boston & Montana, Anaconda C. M. Co., De Lamar G. M. Co., Independence mine and others.

Latest Market Reports.

SAN FRANCISCO, Jan. 30, 1902.

SILVER.—Per oz., Troy: London, 25½d (standard ounce, 925 fine); New York, bar silver, 55⅝c (1000 fine); San Francisco, 55¾c; Mexican dollars, 45½c San Francisco, 44½c New York.

COPPER.—New York: Lake, 1 to 3 casks, $12.00; carload lots, $11.87½; Electrolytic, 1 to 3 casks, $11.87½; carload lots, $11.75; Casting, 1 to 3 casks, $11.62½; carload lots, $11.50. San Francisco: $14 15. Mill copper plates, $17.15; bars, 24@18c. London: £51 7s 6d per ton.

LEAD.—New York, $4.10; Salt Lake City, $3.50; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £10 16s 3d per ton = 2.26 cents per lb.

SPELTER. — New York, $4.30; St. Louis, $3.90; London, £17 2s 6d per ton; San Francisco, ton lots, 5½c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

IRON.—Pittsburg, Bessemer pig, $16.00; gray forge, $16.00; San Francisco, bar, 2.60c per lb., 2.65c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $28.00; open hearth billets, $30.00; San Francisco, bar, 7c to 12c per lb.

TIN. — New York, pig, $23.50; San Francisco, ton lots, 25c; 1000 lbs., 25½c; 500 lbs., 25¼c; 200 lbs., 25½c; less, 26c; bar tin, ℔ lb, 30c.

PLATINUM.—San Francisco, crude, $19 ℔ oz.; New York, $20.50 per Troy oz

QUICKSILVER. — New York, $51.00 large lots; London, £8 17s 6d; San Francisco, local, $48.00 ℔ flask of 76½ lbs.; Export, $45.00

MAGNESIUM.—New York, $2.90 ℔ lb.; San Francisco, $3.75.

ZINC.—San Francisco, 5½c; slab, 5¾c; bar, 7c; zinc dust, N. Y., 6c.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 17c; San Francisco, Plumbers', 100-lb. lots, 14.25c.

NICKEL.—New York, 50@60c ℔ lb.

FERRO-MANGANESE. — Pittsburg, 80%, domestic, $53.50, large lots.

TUNGSTEN.—New York, ℔ lb., 95c; San Francisco, $1.15.

FERRO-TUNGSTEN. — New York, 37%, 32c; San Francisco, 65c (60%).

ASSAY LITHARGE.—San Francisco, 10c ℔ lb, small lots.

PHOSPHORUS. — F. o. b. New York 50@60c ℔ lb.

POWDER.—F. o. b. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 30@31c ℔ lb.; carloads, 28@29c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2¾@3c ℔ lb.; blue vitriol, 5¾@6¼c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 6c; alum, $1.90@2.00; flour sulphur, French, 2¼@2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25@1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls. 8c: caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, pure, boiled, bbl., 72c; cs., 77c; raw, bbl., 70c; cs., 75c. Deodorized Stove Gasoline, bulk, 14½c; do., cs., 20½c; 86° Gasoline, bulk, 20c; do., cs., 26c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 13½c; do., in cs., 19½c; Lard Oil, Extra Winter Strained, bbl., 90c; cs., 95c; No. 1 bbl., 65c; cs., 70c. Neatsfoot Oil, coopers' bbls., 60c; cs., 65c; No. 1 bbl., 50@52½c; cs., 55@57½c.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

AUTOMATIC FEED REGULATING APPARATUS.—No. 691,627. Jan. 21, 1902. George Hoepner, San Francisco, Cal., assigned to the Union Scale & Manufacturing Co. of Sacramento, Cal., a corporation. This invention is designed to provide for an approximately even flow and pressure of material passing through a hopper and belonging to an automatic weighing machine. It consists of a weighing bucket having a vertical movement, a hopper delivering into said bucket, a gate closing the discharge from the hopper, an open-bottomed funnel movably suspended above the discharge part of the hopper, a connection between the funnel and the hopper gate whereby said gate is opened by the descent of the funnel, means for locking the gate in its open position, and means connected to said look and controlled by the weighing bucket for releasing the lock. A funnel is suspended within the hopper from one end of a fulcrumed lever, the other end of which connects with the gate, and an inverted cup fixed centrally within the cone of the funnel regulates the flow of material and prevents the movement of the parts being interfered with by the body of grain within the hopper.

DEVICE FOR FORMING ORNAMENTAL STRUCTURES.—No. 691,596. Jan. 21, 1902. L. B. Christopherson, Stockton, Cal., one-half assigned to M. M. Gillespie. The object of this invention is to form ornamental structures from flexible strips of material This material may be leather or other suitable material which is cut into rectangular form, then a number of slits are made longitudinally with intermediate uncut portions alternate from one side to the other of the strip. The strip is then opened transversely and by means of suitable unions or connecting pieces the edges of the strips thus opened out are secured through the unions to like edges of adjacent strips, and in this manner provides curtains, table covers, festoons, piano scarfs and ornamental structures generally can be easily made.

PROTECTING TREES.—No. 691,546. Jan. 21, 1902. T. J. Hubbell, Watsonville, Cal., assignor to D. Hubbell and W. H. Ames, same place. This invention comprises a method of protecting trees from the ravages of codlin moth and similar enemies of trees It consists in applying a plastic substance to the trunk to form an even surface, then placing a soft annulus about the trunk proximate to the coated surface, and finally placing a flexible strip about the trunk and securing the upper edge just above the annulus, said strip having its surfaces coated with a viscous or glutinous substance.

HAY LOADING APPARATUS.—No. 691,659 Jan. 21 1902. E. H. Nicholson, Santa Maria, Cal. This invention comprises a rake having a horizontal portion and an upwardly projecting rear portion. Tapes are fastened to the top of the rear portion and detachably secured to the forward end of a horizontal portion. A rake is moved along the ground until a load has been gathered upon it, and the detachable front ends of the ropes are then carried up over the load, and by pulling upon the ropes the load is rolled from the rake up the incline and upon the wagon.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING JANUARY 21, 1902.

691,606.—JAR CLOSURE—R. H. Austin, S. F.
691 595.—FRUIT GATHERER—J. D. Carter, Baker City, Or.
691,597.—BICYCLE—A. P. Christiansen, Gardnerville, Nev.
691,596.—ORNAMENTAL STRUCTURES—L. B. Christopherson, S. F
691,7 4.—HAY LOADER—F. S. Church, Sierra Valley, Cal.
691 532.—CHILD'S CHAIR—I. M. Clark, Lompoc, Cal.
691,357.—GAS GENERATOR—W. W. Cozins, Linden. Cal.
691,612.—PISTON PACKING—H. Dods, Virginia City, Nev.
691,614.—PEN HOLDER—S. W. Durham, San Jose, Cal.
691,457.—SILK REEL—J. P. Evertz, San Diego, Cal.
691,702.—ROTARY CUTTER—T. F. Hagerty, S F.
691,376 —FRUIT PICKING SACK—E. Harter, Arlington, Cal.
691,627.—FEED REGULATOR—Geo. Hoepner, S. F.
691,546.—TREE PROTECTOR—T. J. Hubbell, Watsonville, Cal.
691,365.—HORSESHOES—S. Jannus, San Carlos, Ariz.
691,648.—SMELTING FURNACE—G. Mitchell, Los Angeles, Cal.
691,649.—PIPE CUTTER—G. Mitchell, Naco, Ariz.
691,659.—HAY LOADER—E. B. Nicholson, Santa Maria, Cal
691,7 6.—BEVEL—N. B. Norfolk, Los Angeles, Cal.

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MINING AND SCIENTIFIC PRESS.

Whole No. 2168.—VOLUME LXXXIV. Number 6. SAN FRANCISCO, SATURDAY, FEBRUARY 8, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Dams and Reservoirs.

Probably in no class of engineering structures will there be so many new constructions of great works during the next few years as of dams and reservoirs. This is particularly the case in the western portion of the United States, though some notable dam structures of great magnitude are already under way in the East. Cities during late years have grown in population and industry out of all proportion to estimates made a decade or two ago. With the growth has come a proportionately greater expansion of the use of water till in many instances it has outrun in ten or twenty years the provision of supply made in the expectation that it would suffice for fifty years, or even a century.

The ceaseless commercial pressure for the cheapest and most permanent source of power is a second great cause of the starting up of activity toward the conservation of water supplies. The third great cause is the development of land values in the arid and semi-arid regions made possible by the use of water.

All of these economic demands, working on the surest lines toward the quantity and permanence of water supply, are most completely satisfied by the construction of artificial reservoirs and dams. Natural stream flows are irregular and uncertain in quantity with the change of the seasons. Reservoirs that store flood water can be used to equalize the quantity of stream flow through all the seasons. They also conserve flood waters that can not be used in the flood seasons to the seasons of no floods, when the use of the water is indispensable.

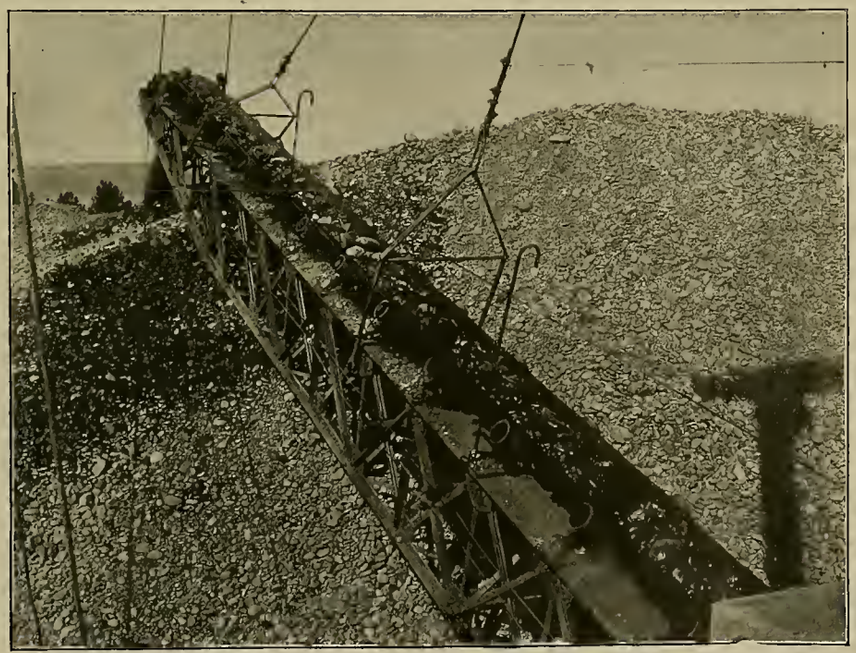
With a perfected knowledge of what may hereafter be required of the stored water of reservoirs, the construction of the latter is now made complete in the beginning. Timber, vegetable growth and surface soils that may impair quality are now removed in advance of the dam construction. The latter is now planned and proportioned in the beginning to ultimate structural limits. The causes of many failures are being studied to insure a higher degree of safety in subsequent structures.

It is suggested that, in the planning of dams, engineers should take no chances. Safety is an absolute requirement. Many dams are now being planned of great height and length. The conditions of water pressure on the dam which will be developed when the reservoir made by it is filled with water, should be studied in advance. Many rocks not permeable by water, so as to create hydrostatic pressures on the base of a low dam, become permeable and develop water channels through which the hydrostatic pressure of the water column behind the dam acts with lifting force against the base, where the dam is high. This possibility should be thoroughly studied out to a certain conclusion in advance.

Constructing engineers will understand that such a hydrostatic pressure applied by nature through even minute rock seams and openings acts on the dam in the manner of the pressure developed by a hydraulic press. It is a quantity of energy in the form of a lifting force, which balances an equivalent in weight of the dam and the resultant pressure of the reservoir water against the face of the dam. The real stability of the structure is measured by the quantity of unbalanced weight. This latter can be increased by increasing the mass of the dam over what is required to insure against overturning by the direct pressure of the reservoir water on the inside face. This results in the necessity of engineers considering these great dam structures as problems for which each must have its own formula of safety. Too great a dependence must not be placed on a general formula in high dam construction.

More than any other structure built by engineers, dams should be fool-proof. The element of weakness that is forever potential in man should be eliminated. There should be left no opportunity for human judgment, or the failure of it, to determine the maintenance of dam structures. The materials of construction should be, as far as human foresight can provide, imperishable. It is very questionable if composite dam structures should be built at all where one or more of the materials of construction is perishable. The steel portion of composite steel and concrete structures, allowed to deteriorate by the carelessness that fancied security always induces, is sure to fail some time. Spillways that are not open permanently, but depend on attention from an operator, should not be permitted in dams.

Robins Belt Conveyer on Gold Dredger, Indiana G. D. & M. Co., Oroville, Cal.—(See Page 74.)



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MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 4 50

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

☞ MR. GEO. S. SCOTT is now our Chicago representative, office 737 Monadnock Bldg., Chicago, Ill., and is authorized to transact business on behalf of the MINING AND SCIENTIFIC PRESS.

San Francisco, February 8, 1902.

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THE Senate has passed the bill creating the Department of Commerce. For the Senate the action was quick. The bill to create the Department of Mines is still in committee in the House. Now that the latter has control of the bill creating the Department of Commerce the members with mining constituencies should see to it that it gets no preference of consideration and right of way over the bill creating the Department of Mines. The latter is as desirable as the former, if not indeed more desirable. To even up the legislative situation the bill to create the Department of Mines should be passed by the House and sent to the Senate in advance of the House consideration of the Senate bill to create the Department of Commerce.

ATTEMPTS at the wholesale appropriation of mineral lands in California seem to be continuous. The latest is located in Shasta county, where a railroad project to open up the Bully Hill copper district and the Pitt river country has been made the pretext for a mineral land appropriation by the old methods. There is a public protest developing, but so far the adverse individual claims of miners, which do the effective fighting against such attempts, are not much in evidence. If effective opposition is to be made, the miners themselves, who are affected by the fraudulent appropriations, must contest them. The presence of valuable mineral on public land is a fact which has to be proven before a trial court. The miners should not delay getting the evidence and presenting it to the land office in proper form.

MINERS in the Territories are receiving some well directed attention from Congress, and legislation is under consideration looking to their protection from the neglect or carelessness of mine operators. There is no excuse for needlessly unsafe mining. If a mine will not pay the cost of securing the safety of the miners who work in it, it should not be permitted to be operated. Legislation by Congress for miners, while it requires considerable time, is apt in the end to be better balanced to the respective rights and necessities of all parties interested than laws made by local legislatures on the same subject matter. It is much less influenced by the temporary interests of individuals or localities. The pending laws relating to coal mine ventilation should be enacted. Advantage might well be taken of the opportunity to add amendments, by providing some necessary laws about mine openings. The preventing of one such disaster as that at the Smuggler mine at Telluride, Colo., justifies such action.

Monopolies of Mineral Production.

The monopoly of a natural mineral production is an attractive commercial idea. With some minerals it has been accomplished with a sufficient degree of commercial success to obscure, or at least make indeterminate, the limitations of such monopolies. The conception of the idea of a monopoly of a mineral product is rarely made by the miners. It is usually originated by the business men who are only incidentally miners, and who see in minerals which come out of the earth things to be bought and sold of which nature has limited the quantity. It is assumed that if there are limits to the quantity of mineral in available natural deposits, and these limits are known, there is the basis of a monopoly in its production and sale. The creation of the monopoly is business. The means used to accomplish it are considered as constituting an art by themselves.

There are temporarily real limits to the available natural supply of some minerals. It is doubtful if there are any permanent real limits. Monopolies of production of minerals are, therefore, only at the best more or less temporary. It is the people who clearly recognize this condition and limitation that make the business successes of it.

Diamond production is at the present time, perhaps, the most conspicuous example of a mineral monopoly. The South African diamond fields at Kimberley and vicinity are the most productive and cheapest worked deposits. The supply from this source originally took control of the market for diamonds by selling the cheapest and in quantity to supply the entire demand. Stopping the production from other fields—notably Brazilian fields—by selling under the cost of production in them, a consolidation of the individual interests in the limited South African field has made a monopoly strong enough to advance the price again by regulating the supply. Still, it cannot be affirmed that there are no other deposits which can be discovered, and, discovered, make a quantity of production which will break the monopoly. It is possible yet to find the rock source of the Brazilian diamonds, which so far have only been recovered from detrital placer deposits. Reports of discoveries in British Guiana of diamonds in detrital deposits indicate quantities which it is hardly thinkable could exist far from original rock sources. Exploiting these new fields, apparently highly payable, with the experience and knowledge we now have of original diamond-bearing rocks, it is reasonable to assume that not many years will elapse before these rock sources are found and a possible rival to Kimberley establishes itself. Could the sale prices, that make the present monopoly so profitable, be maintained when a considerable increase in the quantity of diamonds produced is made? It hardly seems reasonable to so conclude.

Other gem stones, excepting only the ruby, seem to be too widely and plentifully distributed to become the basis of a monopoly of their production. The sapphire apparently looked promising for this purpose and less than a year since the known Montana deposits that might compete were consolidated to control prices and quantity of production. Since then two other localities in Montana are found to be largely sapphire bearing, and the commercial value of the consolidation already made is practically discounted and wiped out of existence. The discoveries of corundum in Montana in still other localities are suggestive, too, of still more sapphire bearing localities to be found. Arizona and New Mexico are productive of so many new turquoise discoveries that the monopoly supposed to have been successfully and firmly established on the first discoveries is at an end.

Among minerals in common use in the arts, borax a number of years since was supposed to have natural limitations of available deposits which made their consolidation practicable. Just as it was effected and became commercially profitable the extent of available deposits increased by discoveries which destroyed the monopoly. The monopoly of the production of nitrate of soda which the owners and operators of the Peruvian deposits have had is about to be broken by the discoveries of deposits in the California and Nevada deserts.

With attempts at monopoly of several metal productions there has been the same conclusion. In nearly every instance the monopoly effected by consolidation lasted just long enough to demonstrate that the limitations of available natural deposits of the metal ores were very much underestimated. It can be added that the conclusions demonstrated that what were in fact limitations were not at all comprehended in advance. Two attempts have been made to monopolize copper production. The first was more of the nature of a "corner" in the metal as a commodity than a monopoly of production. Its ultimate failure suggested as the cause the failure to monopolize the production of the mines. The second attempt undertook this last. It failed because there were more copper mines, and more mines which produce copper, than the projectors of the monopoly had estimated in advance. With zinc there are more or less tentative projects for a monopoly, but experience is recent enough with copper to suggest that a monopoly of the purely zinc producing mines becoming profitable would make new zinc mines out of the waste dump piles of hundreds of mines to which an earning from zinc would be like finding money on the highways.

Even the production of iron and coal cannot be monopolized on the basis of natural limitation of deposits. There are substitutes for coal. Iron is common and the monopoly of deposits in one locality does not prevent development in another locality. On the contrary, it furnishes the incentive to development. The very publicity that the success of a monopoly in a mineral or metal brings suggests the sharing of its profits by imitation of it on a large scale or competition with it on a small scale.

SOME waste in the operation of a mining business is inevitable and unavoidable. More kinds of waste are avoidable. The distinction should be noted and all losses of efficiency of men, machinery or methods should be investigated and measured in order to eliminate such as can be determined as being avoidable. The line between the necessary and the avoidable waste is not fixed. It is itself variable, and each problem of operation is to be solved recognizing this. To illustrate, in the simplest mining operation—the mining and milling of gold-bearing quartz—no complete recovery of the gold in the rock is made. Some must waste, no matter what methods of mining of ore or reduction of it are employed. The amount of that absolute loss or waste is more or less dependent on the scheme of work. The cost charges of the different schemes of work also vary. The scheme of work that makes the sum of the cost charges and the absolute loss the least is the best, commercially considered, independent of whether or not the absolute loss is the least possible. The loss here is an unavoidable loss, to be accepted even though it is not the least loss of gold that could be made. The same principle extends through all expert determination of mining schemes. Neglect of it with many mining operations means the difference between commercial failure or commercial success. And it must not be assumed that in mining there is any other kind of success but commercial success that counts. Eliminate avoidable wastes, but be sure that it is certainly known what are the real avoidable wastes.

NEVADA COUNTY, CAL., is already showing the effect of the increased attention being given to gold mining in the last month or two. For some years there had been no gain in the extent of, or production from gold mining. If anything, the impression from a casual investigation would be, that the number of the mines and their output was diminishing somewhat. Lately, however, there has been a notable increase in new enterprises and in reopening old mines. Grass Valley and Nevada City districts, while easily first in the extent of this favorable change, have no exclusive possession of it. The old camps of Rough and Ready, French Corral, North Bloomfield, Washington and Meadow Lake, that in the lapse of years had become all but abandoned, have taken on a new period of life with the reopening of the old mines. As mines are exploited to-day these old mines are in their infancy. Some of the supposed worked-out properties are found with barely prospected croppings, though mills built on them in the early hurry days of California mining long since disappeared even as streaks of rust. There is nothing but what is good to be said of the present expanding gold mining industry of Nevada county.

Concentrates.

THE velocity of sound in water is 4.9 miles per second.

THERE is no California State tax on the issue of stock in corporations.

AN ordinary speed to run pumps is 100 feet of piston motion per minute.

A CUBIC FOOT OF ICE weighs 57.25 pounds and of water 62.38 pounds.

THE water in the river must be above the trough to make the water wheel run.

AN ALLOY that expands in cooling is made of 75% lead, 16 2/3% of antimony and 8 1/3% of bismuth.

TO SHARPEN DULL FILES, immerse them in dilute sulphuric acid till they are eaten into deep enough.

THE life of a good gas or gasoline engine under ordinary conditions and with proper care is fifteen to twenty years.

A "STANDARD CANDLE" is one that consumes 120 grains of spermaceti per hour, made six to the pound, and ⅞ inch diameter.

ALUMINUM BRONZE can be produced by highly heating a mixture of alumina and copper chloride in contact with calcium carbide.

AN ordinary burn from an electric current can be relieved by application of a solution of one part nitric acid and seventy-five parts water.

"CONCENTRATES" does not know why a forked willow stick turns down in the hands of some men and does not in the hands of other men.

A DYNAMO can be run by water power as well as by steam, but it will be absolutely necessary to secure steady motion by a steady pressure of the water.

MINING LOCATIONS can be made in forest reservations on compliance being made with rules and regulations established by the Interior Department.

BOILER TUBES often wear through rapidly where internal feed pipes are allowed to rest upon them. Such pipes should be hung from the braces or shell.

THE proportion of ferro-manganese used in a ton of steel is so small in amount that it is scarcely calculated, even though that product costs nearly $100 per ton.

A MINING LAW in Colorado prohibits parties from locating mining claims before sunrise in the morning and after sunset in the evening. There is no such law in California.

IN a case decided in the Douglas county, Or., circuit court it was held that the right of private ownership of land bounded by unnavigable streams extends to the center of the stream.

THE chief commercially exploited minerals found in Peru are gold, silver, copper, coal, quicksilver, petroleum, salt, borax, lime, ochre, marble, sulphur, alkaline salts and phosphates.

NO LOCATION of a placer claim can be made to exceed 160 acres, whatever may be the number of locators associated together, or whatever the local regulations of the district may allow.

THE largest gas engine built on the Pacific coast is a 300 H. P. engine built by the Union Gas Engine Co. of San Francisco. The Westinghouse Electric & Mfg. Co. of Pennsylvania has built a 650 H. P. gas engine.

THE deputy surveyors who were supposed to have surveyed many of the townships in the arid and treeless regions failed to establish corner monuments. Having never been placed originally, they cannot be found by retracing the lines. They must be re-established first.

BY USING for the making of mortar lukewarm water in which carbonate of soda has been dissolved, masonry can be built with the temperature as low as 18° F. below the freezing point, the laying of the stone in cold weather of that temperature being attended with satisfactory result.

THE highest price of Lake copper in 1901 was 17 cents, lowest 13 cents; in 1900 highest 17 cents, lowest 16.25 cents; in 1899 highest 19.25 cents, lowest 13.37½ cents; in 1898 highest 13.12½ cents, lowest 10.85 cents; in 1897 highest 12 cents, lowest 10.75 cents; in 1896 highest 12 cents, lowest 9.75 cents.

AN ordinary 16-candle power 110-volt lamp has about 220 ohms resistance. About 1000 feet of No. 10 B. & S. gauge copper wire has an ohm resistance. Two thousand feet of the same wire would have two ohms resistance, while a wire twice its size in cross sections would have only one-half an ohm resistance.

HYDROCHLORIC ACID is made by the action of sulphuric acid on common salt, gaseous chlorine gas being evolved and sulphate of soda formed. The chlorine is transformed into hydrochloric acid by absorption in apparatus through which water is traveling. "Bluestone" is the result of direct action of sulphuric acid on copper oxide.

UNDER the laws of Colorado a mechanic's lien can be put on property in favor of architects, engineers and artisans who have rendered professional services on property, and declares that the right shall extend to all persons who shall do work or furnish material for the working or developing of any mining claim, or for such services in search of metals or minerals. The courts have held that a geologist or mining expert, who contracted to explore and examine certain mines and the surrounding country in reference to their mineral and geological character, is not entitled to a lien on the property for such services.

MEXICAN mining law does not recognize "extralateral rights." On that subject it says: "The unit of concession or mining claim shall be a solid of indefinite depth, limited as to its exterior boundaries by a section of the surface embraced within horizontal plane measuring 100 meters on all four sides, and in depth by vertical planes passing through the same."

AS BETWEEN round and square drift bolts driven into wood in holes ⅛ inch to ¼ inch smaller than the bolt, engineers give preference to the round bolt. The holding power of a 1-inch bolt varies from 6000 to 15,000 pounds per lineal foot, depending on the kind of wood, the relation between diameter of hole and diameter of bolt, and the time after driving before the test is made.

A COMPASS SURVEY made with care, but requiring no special refinement of methods, will accomplish what is required to direct the work of making a connection between two drifts on the same level of a mine. To eliminate any difficulty from magnetic attraction, read the angles between the courses, setting up the compass at every angle and reading the interior angle between the back sight and the fore sight.

UNDER the Revised Statutes of the United States, Section 2324, providing that, on the failure of a claimant to perform the requisite amount of work on a mine, it shall be open to relocation, unless the original locators shall have resumed work on a mine before such relocation, where plaintiff in good faith resumed work on a mine previously located by him the day before the defendant's location thereof, plaintiff has the superior right thereto.

THE ampere is the unit for the rate of electric flow, and one ampere produces a certain effect, which effect is as definitely and accurately determined as the flow of a gallon of water per second. It is the current which, when flowing in one direction, will deposit, from a solution of nitrate of silver, metallic silver at the rate of 0.001118 grain per second. An ordinary 16-candle power 110-volt lamp uses about one-half ampere. Amperes, like volts, in themselves do not represent power.

WITH a fall of 55 feet (55 feet head), and a flow of 10 cubic feet per second, to find its power: Ten cubic feet of water weighs approximately 625 pounds. Taking the product of these two factors, 625×55 equals 34,375, the number of foot pounds per second of the waterfall. This divided by 550 gives the horse power, as a horse power equals 550 foot pounds per second; 34,375 divided by 550 equals 62.5, the horse power or rate of work of the fall. This acting for one hour would do 62.5 H. P. hours of work, and in two hours 125 H. P. hours of work.

WHERE two dissimilar rock formations come together the line of joining is called a contact. Such a contact may be mineral-bearing. One horizon of the contact may have enough mineral concentration to make a mine. Another horizon of the same contact may be barren or have too little mineral to pay. The horizon of a contact as here referred to is the line as exposed at the surface or other similar lines beneath the surface. If there is no value to justify mining at the surface, only mining work with the pick and drill will tell whether there is any beneath the surface.

ALUMINATE OF BARIUM, a compound formed by the action of baryta on bauxite, is said to be a good and cheap agent for the purification of water which contains gypsum or lime in solution. It is readily soluble in pure water, but added to water containing either gypsum or carbonates of lime a double decomposition takes place, an insoluble aluminate of calcium being produced, together with insoluble sulphates or carbonates of barium. The precipitate, which is flocculent, settles readily and takes down with it at the same time any organic impurities suspended in the water.

IN chloridizing roasting of gold ores, the temperature must be kept down in order to prevent the volatilization of the gold chloride that has been formed. The loss of gold by its volatilization in the form of a chlorine compound may, with chloridizing roasting, be as much as 40% to 90% of the content of the ore, according to the degree of temperature and the duration of the roasting. At 100° C. gold is only slightly volatile in an atmosphere of chlorine gas. The volatility increases, slightly however, up to 250°. It then diminishes to below a red heat, but it increases anew at an incipient red heat and increases without interruption to a white heat.

THE nautical mile is a length equal to the average one minute of arc of the earth's meridans. It is 6063 feet or 1852 meters. The expression "knot," as used to express the rate of sailing of a ship, is the equivalent of nautical mile. Its origin came from the old means used to measure the speed of sailing. A triangle of wood, called the "log," was attached to a line and thrown over the stern of the boat when the latter was moving. Against the resistance of the vessel it floated upright and the line being paid out remained stationary while the vessel moved away from it. The cords had knots in it 1/120 of a nautical mile apart. These knots were counted as they passed through the fingers as the vessel moved, and the number passing in half a minute gave the speed of the ship in "knots" or nautical miles per hour. The name has outlasted its origin. The log now is a small screw propeller fastened at the end of a line and towed after the ship. The propeller turns as it is drawn through the water and twists the line till it turns. The number of turns made are registered on a dial at the ship end of the line and the distance traveled is read directly from the dial face.

THE Doetsch process is in use at the Rio Tinto, Spain, copper mines. The ore, being first crushed into pieces of a maximum thickness of ½ of an inch, is mixed with 2% salt and ferric chloride and then piled in heaps 13 feet high, 48 feet long and 48 feet wide. Air and water circulate through vertical chimneys and horizontal canals. On top of each pile is a platform from which water percolates throughout, dissolving the sulphate of iron and salt, producing chloride, that solution taking up the sulphide of copper, the resulting drainage into the basins precipitating cement by means of old iron rails and pig iron, the cement averaging 82% copper. It is a slow but effective process, occupying about two years, at the end of which less than 1% of copper remains in the ore.

SECRETARY OF THE INTERIOR HITCHCOCK has given a decision establishing a rule that "where the same person or company owns several contiguous mining claims capable of being advantageously worked together, and adopts one general system for the purpose of developing them all, the value of the work done and improvements made pursuant to such system, whether done on only one of the claims, or outside of them all, is available toward meeting the requirement of Section 2325 of the Revised Statutes relative to expenditure of $500 for each of such claims. It is not necessary, in order to have its due share of such work or improvements credited to each claim, that such claims should all be embraced in the same proceedings for patent. If the mining laws are complied with in other respects, such claims may be applied for and entered singly or otherwise, and at different times, without in any way impairing the right to have the value of such share credited to them, respectively, under that section."

IN mines where there is a source of electricity always available for lighting, power, etc., current can be taken off the mains for shot-firing purposes. This is a simple and convenient plan and can be used especially in shaft sinking. Caution requires, however, to be exercised or accidents may occur, chiefly because the electric current is a continuous one and there is always, therefore, the risk that, owing to some leakage, a current may be generated in the firing circuit and because the current strength is usually greatly in excess of what is required for shot firing. The conducting cables should be well insulated and should never be connected to the wires of the fuses until all is ready for firing the shot. It is, moreover, best not to trust to an ordinary simple firing key for making contact between the mains and the firing circuit, but to use a bi-polar switch, which insures that neither of the cables of the firing circuit is in electrica connection with the mains until the shot firer throws the switching, when both cables are simultaneously connected with the terminals from the mains.

THERE are several processes of boring wells for oil in use. First, the rotation method, which is used extensively; second, the process of percussion with ropes; third, the process of percussion with rods. The first process involves the use of an auger for boring into and through soft shale, clay, sandy deposits and generally soft stuffs found in the formation of the earth. The auger is like the carpenters' tool and is from 6 to 10 inches in diameter. The tool is easily turned by means of a crosshead at the opening and is sunk into the hole as fast as the latter is bored by means of lengthening rods. These rods are usually 1-inch gas pipes with connections. The boring is done by two men at the capstan, and as fast as some of the earth is loosened it is removed by the sand pump by the letting down of scoops or by using a thread-like contrivance for working up the residue. About 20 to 30 feet per day can be bored in this way and a depth of 400 or 500 feet is the average reached. The second process, which involves the boring of oil wells by percussion with rope, is used in connection with the ordinary oil well rig so frequently seen in newly discovered oil fields. First the derrick is erected, then a steam engine is needed, a band wheel, walking beam and a sand pump. The engine operates the walking beam, to the end of which is attached the device for working the drill. The action of the drill consists in a constant lifting and falling motion, developed by the walking beam, and at each plunge the bit is turned slightly, so that the action is the same as a stone cutter drilling a hole with a chisel and hammer. As fast as the bit loosens the earthy substance the particles are pumped up by means of a sand pump. This type of device can be used in rock as well as soft earth. Boring by percussion with rods calls for the service of connecting rods instead of ropes, as in the previous mode. The rods can be wood or iron. The machinery consists of a machine for driving the rods and the cutting tool. The cutting tool is almost a plain chisel ranging from 10 to 30 inches wide, with a straight edge for soft rock and a beveled edge for hard rock. Sometimes there are two, four or six blades to the chisel. The boring rods are jointed so as to permit lowering to great depths. Two men work the driving machine, which is a windlass for lifting and depressing the rods. It is a simple affair. One man operates the raising and lowering contrivance and the other turns the rod a little at each blow. These are mostly for wells about 100 feet deep. Scoops are used to remove the loosened rock or other material at the bottom of the hole.

Realizing on Concentrates When Shipping is Impracticable.

Written for the MINING AND SCIENTIFIC PRESS by E. A. H. TAYS.

During the last two years' run of the Anglo-Mexican Mining Co.'s mill at San Jose de Gracia, Sinaloa, Mexico, there were produced about 50 tons of concentrates, assaying ahout $60 per ton, that were piled to one side as heing of too low grade to warrant shipping, the idea heing to accumulate until there should he sufficient on hand to warrant the erection of a small smelter. However, that time never came, as the mill was closed down before any great amount had accumulated.

When the last of the slimes had heen run through the cyanide plant we had ahout 3 tons of cyanide on hand, and also zinc hoxes full of partially treated zinc. As there was no market for the cyanide, the idea occurred to me to treat the concentrates mentioned hy cyaniding, the idea heing to get $500 from 50 tons of concentrates (a hy-product) and turn what cyanide might he consumed into cash.

The concentrates had weathered for ahout three years, some two-thirds heing under a rough shed, the halance in the open air. These concentrates should have been roasted, hut that was out of the question. However, all showed signs of oxidation, and due to this. I calculated that we stood a good chance to get at least a 50% extraction, which would give us the desired results.

The weathering had concentrated the hody and

Anglo-Mexican M. Co.'s Cyanide Plant, San Jose de Gracia, Sinaloa, Mexico.

values of the material to some extent, hut our mean expense for shipping, calculated from nearly 1000 tons shipped, showed we could expect only ahout $10 net per ton, or ahout $500 for the lot.

Taking all this into consideration, two tanks were fitted up with filter hottoms (we had heen agitating) and 31.4 tons of the least oxidized material was charged into one, No. 9, and the remainder, 19.6 tons of the more thoroughly oxidized, was charged into the other, No. 10.

In order to wash out the iron and copper sulphates a stream of water was run through the tanks at the rate of two tons per hour for ninety-six hours, when reagents (ferric and harium chloride) showed no signs of soluhle sulphates.

A 0.3% cyanide solution was then run on for twelve hours at the rate of 1.5 tons per hour, and as the tails solution showed no trace of cyanide the strength of this was increased to 0.5% for ten hours more. There heing still no trace of cyanide in the solution coming off, the strength was increased to 1% and run at that for twelve hours.

There heing no sign of cyanide in the tails solution after thirty-six hours' run, and a consumption of 1500 pounds, treatment was suspended and samples taken from the tanks for assaying, so as to see what we were doing, although the zinc hoxes showed we were evidently getting gold. The assays showed an extraction of only 10% from the tank (No. 9) containing the least oxidized ore, and 66% from the tank (No. 10) containing the more oxidized ore, or a mean of 37%.

Calculations showed that we were doing fairly well financially, though rather poorly metallurgically. Treatment was continued for sixty-four hours longer with a 0.3% solution, when the strength was reduced to 0.2%.

It was the one hundred and twenty-second hour of treatment, from the start, hefore the solution coming off showed any signs of a trace of the cyanide, though some of it carried as high as $18 per ton in gold.

Seven hours after the first sign of cyanide in the tails solution treatment was suspended, the following heing the general results:

TANK NO. 9 (LEAST OXIDIZED).

	Gold Per Ton.	Silver Per Ton.
Heads	126.00 grams	241.00 grams
Tails at 56 hours	96.00 grams	234.00 grams
Extraction	23.81%	2.90%
Tails at 129 hours	62.00 grams	231.00 grams
Extraction	50.79%	4.14%
Bullion produced	2009 60 grams	314.00 grams
Cash value	$1335.48 gold	$6.06 gold

Tons treated, 31.4, yielding $1341.54 U. S. gold.

TANK NO. 10 (OXIDIZED).

	Gold Per Ton.	Silver Per Ton.
Heads	99.00 grams	249.00 grams
Tails at 36 hours	34.00 grams	196.00 grams
Extraction	65.65%	21.28%
Tails at 129 hours	14.70 grams	89.30 grams
Extraction	85.15%	64.13%
Bullion produced	1456.28 grams	3130.00 grams
Cash value	$967.77 gold	$60.41 gold

Tons treated, 19.6, yielding $1028.18 U. S. gold.
Total value extracted from both tanks, $2369.72.

After the thirty-six hours some lime was put into each tank and spaded into the surface.

The first lot of solution that was run through the zinc hoxes assayed per ton as follows, original solution, 0.3% cyanide:

	Gold.	Silver.
Heads	11.00 grams	1.60 grams
Tails	2.24 grams	0 20 gram

The second lot, original solution, 1% cyanide:

	Gold.	Silver.
Heads	21 92 grams	3.10 grams
Tails	11.76 grams	0.80 gram

The third lot, original solution, 0.3% cyanide:

	Gold.	Silver.
Heads	28.80 grams	4.96 grams
Tails	14 42 grams	0.48 gram

The tails solution at first was made up to standard and run through the tanks again, hut towards the last it was all pumped up into the storage tank and run through the zinc hoxes again, with the following results:

	Gold.	Silver.
Heads	20 00 grams	5 52 grams
Tails	12.22 grams	9.44 gram

Some little Prussian hlue was noted in the zinc hoxes, and the solution was of a whitish color — turhid — as though colored hy cohalt.

These results heing very unsatisfactory, we having been accustomed to a precipitation in the zinc hoxes of from 95% to 98%, all the solution was again pumped up into the storage tank and mixed with that from the last flow from the tanks, this heing run through the hoxes with the following results:

	Gold Per Ton.	Silver Per Ton.
Heads	7.76 grams	2 58 grams
Tails	6.88 grams	0.68 gram

This was again pumped up into the storage tank and 150 pounds of slacked lime added, the tank having a capacity of 44 tons. When this was done the solution, although rather whitish at the discharge pipe as it fell into the tank, immediately clarified.

The solution, thus treated with lime, was again run through the zinc hoxes, with the following results, the strength of the solution heing 0.6% cyanide:

	Gold.	Silver.
Heads	5.64 grams	0.68 gram
Tails	1.28 grams	0.44 gram

The trouhle with precipitation was due, perhaps, to a small amount of ferric sulphate that remained undissolved hy the thorough washing given the ore before treatment hegan. This, comhining with the cyanide, prohahly produced a ferrous potassium ferric cyanide, which was undouhtedly detrimental to a free precipitation in the zinc hoxes.

As stated, slight signs of Prussian hlue were noted at times in the hoxes, and the solution, until the lime was added, was always slightly turhid.

The lime radically remedied the evil, whatever it may have heen. I noticed that when the turhid solution fell into the tank containing the lime the clarification was virtually instantaneous.

The final results were the following:

EXPENSES.

Labor	$ 120 00
Materials	873 13
Sundries	9 49
Bullion expenses	103 79
Total	$1,106 41
Production	$2,369 72
Expenses	1,106 41
Profit	$1,263 31

COST PER TON.

Cyanide, 62 2540 pounds	$16 94
Labor	2 36
Bullion and all other expenses	2 40
Total	$21 70
Extraction	$41 81
Cost	$21 70
Profit	$20 11

These results are excellent in comparison to what the profit would have heen had we shipped the concentrates to California, our nearest market; hut had the 31.4 tons weathered in the open air, as did the 19.6 tons, the result would have heen just ahout $1000 hetter.

Belt Conveyers on Gold Dredgers.*

An opportunity of reducing the cost, and, at the same time increasing the efficiency of a dredger, is to he found in the application of the perfected helt conveyor to the work of stacking tailings. The Rohins Conveying Belt Co., who manufacture a helt conveyor for this service, have, they state, developed it as a result of actual experimental work on the material to he handled. When they wished to learn the proper size and inclination for stackers of various capacities, they first ohtained several tons of round placer gravel, of the same size as is found in the ancient river heds of California, the stones averaging from four to eight pounds in weight, with a numher of larger houlders, weighing as much as 100 pounds. They then constructed a self-contained belt conveyor, 50 feet in length, so supported that it could he raised to any required pitch. The gravel was delivered in its normally wet condition at the foot of the conveyor, and after being delivered into a chute at its upper end, the same material was carried hack hy a second conveyor, and was in this manner used over and over again. It was possible to change at will the speed of the inclined conveyer with an electric controller.

An example of their type of conveyer is illustrated as installed on the Indiana Gold Dredging & Mining Co.'s dredger at Oroville, Cal. The conveyer shown is 75 feet long with a 28-inch helt, and handles ahout 75 cuhic yards of gravel per hour. The speed of the belt is 250 feet per minute and the angle of inclination is 18° ahove the horizontal.

A large numher of other conveyers of the same type are used in the gold fields of California and Idaho and as far away as Colomhia and Eastern Siheria. The conveyers most commonly used are 80 feet long, which permits of stacking tailings to a height of 35 feet. They are made for this work in all sizes hetween 20 inches and 36 inches, and a great advantage claimed hy the manufacturers for the Rohins conveyer for this work lies in the fact that power can he applied at the lower end, therehy saving the long, and generally tiresome, transmission of power hy rope or chain to the head end, as is necessary with stackers of some other types. The particular advantage which appeals most strongly to the operator of a dredger lies in the fact that a helt conveyer is a very simple machine and largely free from hreakdowns. Further information in regard to the use of helt conveyers for stacking tailings may he ohtained from the Rohins Conveying Belt Co., 15–21 Park Row, New York.

*See Illustrations on front page.

Magnetic Separation of Zinc Ores.

A type of magnetic separator, installed several months ago in a plant erected at Rico, Dolores county, Colo., has since heen enlarged and now handles sixty tons of crude ore daily, the separated zinc ore ohtained heing shipped to the Belgium spelter works.

A company using the same process is now erecting a similar plant in Leadville, Colo., under the supervision of E. B. Green, who huilt and conducted the Rico plant. The work of construction is already under way and the plant, it is stated, will soon he running.

The method of the process as employed at Rico is as follows: The ore is crushed and run over Wilfley tahles, where the lead and silica are separated from the zinc and iron. The latter product is then run through the magnetic separator, the magnets taking out the iron and leaving a clean commercial product, carrying 55% to 60% zinc, worth $12.50 to $15 a ton to the mill. Mr. Green states that the magnetic separator can take a sulphide carrying 20% zinc and treat it successfully, making, in fact, three commercial products—a high-grade lead concentrate, an iron sulphide with practically no zinc, hut which will carry silver, and a higher grade zinc than that supplied hy the Missouri mines.

The initial capacity of the Leadville plant will he fifty tons a day. One feature of the process is a drier for the purpose of expelling the moisture incident to wet concentration. The cost of operation is said to he very low, and it is expected to render the several products ohtained much more profitahle than they are at present.

Mine-Pumping Plant With Electrically-Driven Centrifugal Pumps.

The silver mine of Horcajo, in the province of Ciudad Real, in Spain, was first opened in 1855, and has since been developed so that it supports at present a population of about 5000 gathered into a settlement around the mouth of the mine. In this time the workings have been advanced to a depth of 1280 feet, and are being carried down farther at the rate of about 18 feet a year. The removal of inflowing ground water from the mine has been involved with many difficulties almost from the first, and it is only in the last two years that a plant has been put in operation that fully meets every requirement of the present, and is perfectly adapted to downward extension of the workings (a limiting depth for the mine of 1640 feet is at present in contemplation). The pump installation is highly interesting, chiefly for two reasons: First, the pumping is done by means of compounded centrifugal pumps following closely in design the best principles of turbine construction; and, secondly, an electrical power-distributing system of the most advanced type is interposed between the source of power and the pumps, which gives to the whole plant the feature of simplicity and flexibility that is a large element in its success.

The conditions required to be fulfilled by any pumping installation in this mine were that it be absolutely reliable in operation, that extension to greater depth might be rapidly and easily accomplished, and, as a secondary matter, that it be reasonably economical in the use of coal. Though the first two conditions were of prime importance, the location of the mine—20 miles of mountain road from a railroad station—required considerable attention to the third.

The successful installation consists of three-phase generators driven by horizontal compound engines feeding current to the induction motors directly connected to the pumps. Pumps are installed one unit each at the eighth, fifteenth and nineteenth levels, at respective depths of 470 feet, 940 feet and 1260 feet below the mouth of the mine, and a fourth unit at the lowest level that is being worked. A reserve pump unit is always on hand, and as a lower level is attacked this unit is put in place and connected to the piping, the one in the level just above being cut and dismounted, to be set in place in the next level when that is opened.

The pumps constitute the most interesting feature of the plant. Each pumping unit is a four-stage pump, having four pressure wheels mounted on the same shaft and within the same case. The total pressure against which each unit works, running at 900 revolutions per minute, is about 240 pounds per square inch. The construction is shown in Fig. 1, which gives a longitudinal section through at the left center line of shaft, and at the right a transverse section through center line of discharge casing. The four-blade wheels, marked a, h, c and d in the longitudinal section, have water passages curved as shown in the sections. The arrangement of channels leading the water from one wheel to another is intricate. Just outside each pair of wheels, a, b, c and d, is a casting, g^1 and g^2, rigidly fastened to the pump casing, in which spirally curved guide passages are formed, and, as indicated by the arrows, the water flows outward through these guides into annular collecting chambers surrounding the respective wheels. From the collecting chambers separate sets of passages lead the water to the inner openings of the succeeding wheel. Between wheels b and c these passages are comparatively direct, but between wheel a and b, and c and d, the water must flow through channels, h, of triangular section cored out in the guide castings g^1 and g^2, respectively, between the guide channels for the discharge of the wheel. The annular chamber receiving the discharge from wheel d is larger than the others, and is fitted with two outlet openings located on opposite sides at angles of 45° with the horizontal. In any particular case, the more conveniently placed of these two outlets may be used, the other being closed off by a cover plate. Similarly, the suction end of the pump is formed as a tee with two opposite openings, so that no matter which side of the pump faces the piping no trouble will be experienced in making the connections.

The action of the pump exerts a resultant thrust toward the left end of machine, and to take this thrust a ball bearing is provided, shown at the extreme left end of the shaft. To the right of this is a ring-oiling journal bearing; the other bearing is formed in the cover of the pump, on the right, and is lubricated by a compression grease cup. Where the shaft passes through the casing at the left it is surrounded by a tight bronze sleeve, m, which passes through a stuffing box, n. In the lowest pump in the mine, which has a pressure less than atmospheric in its suction end, the pipe, k, is provided, leading from the first pressure chamber to a small passage surrounding the shaft just behind the stuffing-box, and producing thereby a water-seal that prevents the entrance of air at any point.

The construction of the pump is such that all parts may be readily taken apart and inspected or cleaned. The cover casting at the right may be removed on loosening the screws holding it to the case, whereupon the shaft, together with wheels, guides and channel castings, may be drawn out. In operation it has been found advisable that each pump be thus taken apart and cleaned every two or three months. At such times the bronze sleeve, m, is renewed, as the grit in the water produces rapid wear at this point. The ball thrust bearing also requires renewing rather frequently, but it is found that neither wheels nor guides wear appreciably, although the water contains much fine, sharp, quartz sand.

Each pump unit is driven by a motor mounted on a common base with the pump and connected with it by an elastic jaw-clutch coupling.

The motor is a six-pole, three-phase induction motor operating with a potential of 1000 volts and at a speed of 850 to 900 revolutions per minute, with a normal capacity of 250 H. P. The details of the design were largely influenced by the small starting torque required. Each field winding has forty-two turns, seven wires in each layer. The three coils of each phase are series-connected among themselves, and the sets are mesh-connected with each other. The rotor has 180 slots, each carrying two copper bars of rectangular cross-section; each set of six successive bars is connected in a series circuit. The motor is almost entirely enclosed, so that it might be protected as much as possible from condensation and drip liable to occur in the chambers of the mine. The design is remarkably compact; the largest diameter of the motor case is 56 inches, and the total weight of the machine is about 5.3 tons.

The greatest care was given to thorough insulation in the construction of the motors. Shortly before the new installation was put into service an accident to the old machines permitted the water to rise so that the lower windings of the stator were submerged for several hours. The following day the motor was carefully dried out with a charcoal fire, and, upon being tested, showed not the least deterioration of insulation. Another motor, after running nearly a year, became so charged with soot and dust that the flame of a lamp used in examining the bearings ignited this accumulation. The motor was stopped and the fire extinguished by closing the air openings; the motor was found to have suffered no damage whatever, but was cleaned and running again in 3½ hours. Since that time the motors are cleaned at regular intervals.

The generating plant consists of the three steam engines of the old pumping plant belted to a generator, and one new engine direct-connected with its generator. The old engines are horizontal cross-compound engines of the poppet valve type; they are at present run at a speed of 84 revolutions per minute, though originally intended for only 65 revolutions per minute; with steam at 110 pounds and high pressure cut-off at ⅕ stroke, 240 H. P. are developed. The generator belted to each of these engines is a 20-pole generator running at 270 revolutions per minute and delivering a three-phase current at 1000 volts pressure. The normal capacity is about 280 H. P.

The new engine recently installed is in general similar to the three other engines, but runs at 110 revolutions per minute. With steam at 110 pounds and high-pressure cut-off of ⅕ stroke, a power of 375 H. P. is developed. The generator direct-connected with this engine is a revolving field, 48-pole alternator. A belt-driven pole exciter is used in connection with this generator.

The shaft through which the piping is carried is used for no other purpose. It was therefore feasible to run the transmission cables in this same shaft without particular means for protection. A framework of old rails is laid across the shaft at intervals of about 35 feet, and on these frames the cable-carrying clamps rest. One of a pair of such clamps is shown in Fig. 2, which needs no further comment.

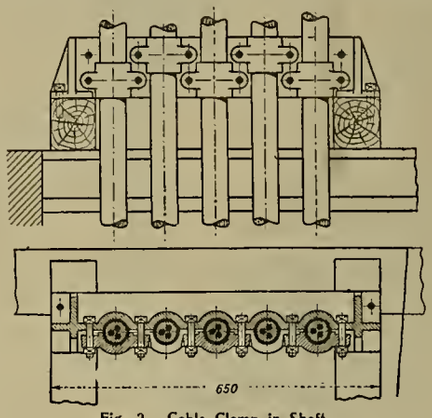


Fig. 2.—Cable Clamp in Shaft.

Provision is thus made for ten cables, which will meet all possible future requirements. Each cable has three insulated conductors, each of 0.12 square inch section stranded together. The cable has a double lead sheath and is armored with two layers of galvanized iron wire. The cable weighs seven pounds per linear foot; it can sustain the weight of a length of about 1000 feet of itself. A reserve cable leads into each pump chamber as precaution against accident.

The method of starting the pumps is rather interesting. An autotransformer with 400 volts pressure in the secondary is first thrown into the circuit of one generator. The motor is then thrown on, taking a current of 200 to 240 amperes. When it reaches its normal speed the current suddenly drops, and the full tension is then put on the motor. The second motor is then started, then the third, and finally the transformer is cut out. During this period of starting, the engine driving the generator in use is run below its normal speed. The pumps are then not able to overcome the delivery pressure and the only power consumed is that necessary to churn the water in the wheel cases. When all motors are running at speed and under line tension, the engine is slowly speeded up, until the pumps begin to deliver water. The flow, however, is throttled by valves at the lowest pump and at the delivery at the surface, so as to prevent overload on the generator. The second and third generators are then thrown in successively, in parallel with the first, and the water valves fully opened, putting the system into complete operation.

In operation up to the present the maximum demand made upon the system has been twenty-two gallons per second; the mean pumpage during this time has been 1,425,000 gallons in twenty-four hours, an average of 16.5 gallons per second. Below about fifteen gallons the pumpage is regulated by throttling the water discharge; above that limit the regulation is accomplished by manual governing at the steam end.

All parts of the plant have proved most satisfactory. The pumps were tested before installing; they were found to deliver 18.5 gallons per second under 425-foot head, when running at 890 revolutions per minute. The efficiency obtained was 76%. The motors driving the pumps showed efficiencies of 94% and 42% at 250 H. P. and 150 H. P. output (cos p = 0 85 and 0.80 respectively). The armature slip is very small, amounting to only 0.7% at 165 H. P. output. The generators are also of high efficiency. The three older alternators yield 93% efficiency at 300 H. P. inductive load (cos p = 0.8), and 90% at 150 H. P. The newer and larger machine presents about the same figures at 400 and 200 H. P. output, respectively.—Dr. F. Heerwagen in the Zeitschrift des Vereins Deutscher Ingeniere.

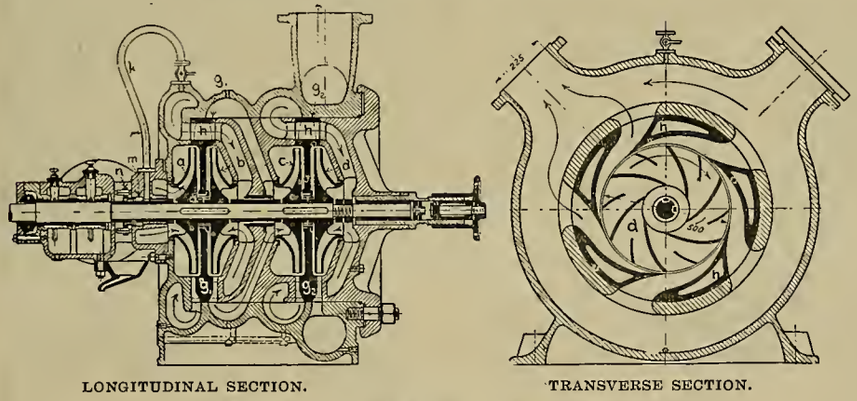
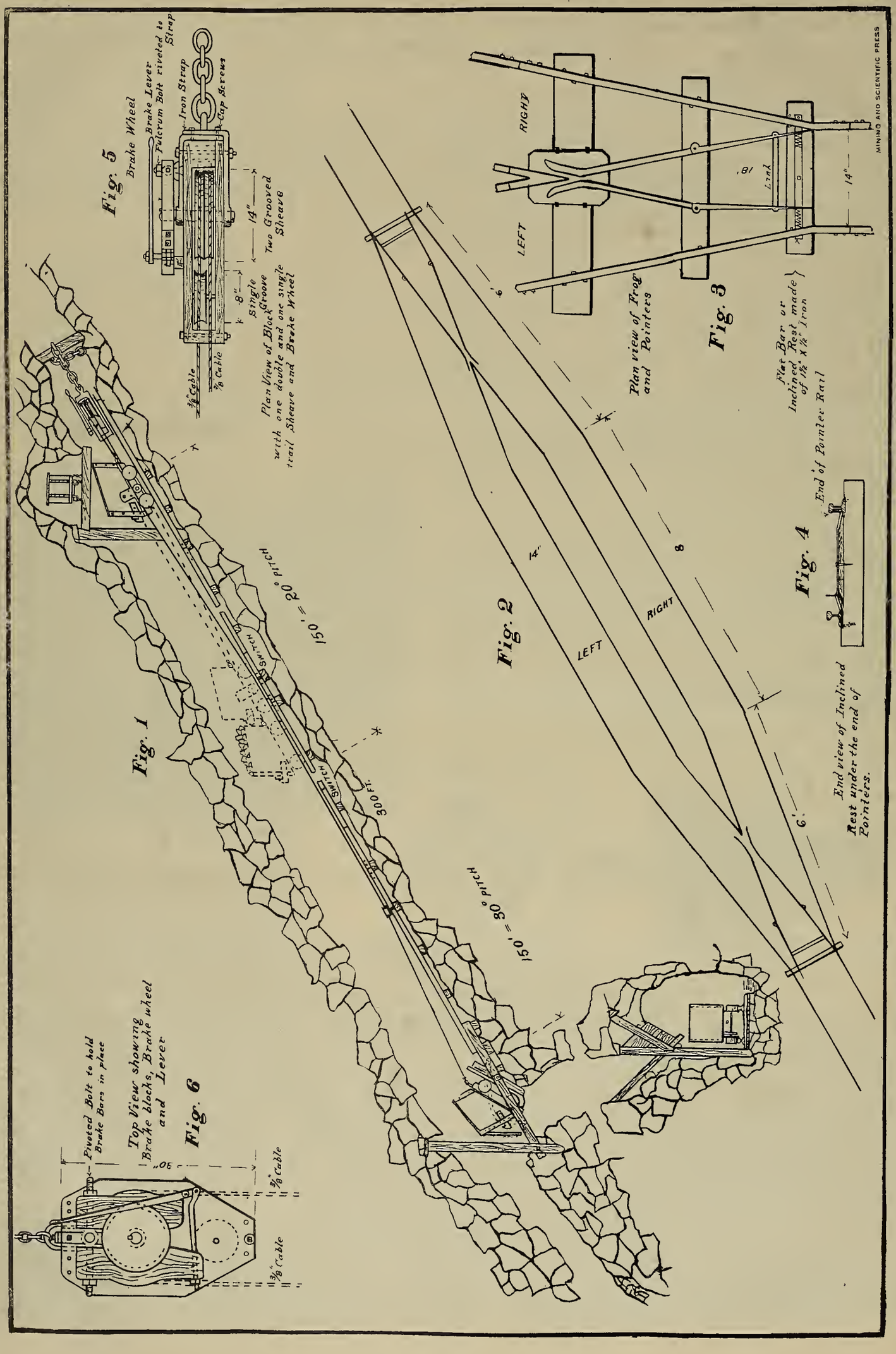


Fig. 1.—Four-Stage High-Pressure Centrifugal Mine Pump.

A NEW mining code has been adopted in Peru. The important points are that the ownership and use of mining property are transferable. Prospecting on unexplored lands is allowed for two years, no other person being permitted to prospect during that period on the ground granted. Mining grants measure 200 meters square, or 4 hectares. The Government tax per mine is £3 per annum, payable half-yearly.



Single Track Jig, Gold Hill Mine, Grass Valley, Cal.—(See Opposite Page).

A Single Track Mining Jig.

Written for the MINING AND SCIENTIFIC PRESS.

The sketches accompanying this description show a single track gravity tramway that has been in successful operation for over eight months at the Gold Hill mine, Grass Valley, California, of which R. Walker is superintendent.

A "raise" of several hundred feet in length, and ranging from 20° to 30° in pitch, was to be opened. It was expected that the pitch would be great enough to make it possible to remove the waste by shoveling down. It was run as small as possible, the progress depending upon the amount of waste removed, air drills being used in the face.

This way of working answered well enough for 200 or 300 feet, but for any further work in continuing the raise and running intermediate levels, the superintendent decided that some other way of handling the waste would be more economical, and suggested that a "go devil" or gravity tramway be put in, the details of which were left to C. T. Rouner, the engineer in charge.

The gravity tramways used in stoping in Grass Valley, first introduced by a Mr. Abe Hall in the Massachusetts Hill mine, are usually constructed with two separate tracks and two small cars with a sheave or small drum at the top. The cars are connected with a cable and so arranged that the loaded car going down brings the empty one up, each car keeping a separate track the entire length of the run.

As the raise already run in the Gold Hill mine was scarcely large enough for one track, two tracks were out of the question, as to make room for a double track the greater part of the raise would have to be blasted out and shoveled down, involving considerable expense and loss of time.

A single track with a short section of double track and two automatic switches midway between the bottom and top of the completed portion of the raise was deemed most practicable.

The switches were made with the common short pointers, hinged at the end, connecting with the Tee rails. They are thrown both mechanically and by gravity, which is somewhat novel, inasmuch as it is so very simple. The pointers connected by a link rest on a flat iron bar near the sharp ends (Fig. 3). A section in the center of this iron bar (Fig. 4) is raised about 1 inch, forming two inclines from the bottom of each rail toward the center, the iron bar continuing under the rails and securely nailed. These inclines are about 2 inches long. When one pointer is down at the bottom of one incline and in position to take the car wheel the other is drawn by the link a little over the top of the incline on the opposite side.

By being connected with a cable the cars must necessarily keep their own siding each time they pass, consequently the switches are shifted only when the cars approach them from the hinged end of the pointers, and only one wheel engages a pointer in passing from the double to the single tracks. This pointer being at the top of the incline and a little over 2 inches away from the rail, the gauge is narrower (Fig. 3) at this point, and the incline raising an inch high (Fig. 4) a considerable more weight comes on it than on the opposite rail. As the car advances the pointer is crowded mechanically toward the incline when it goes down by gravity snug against the rail with the weight of car, and remains there until the car passes out and returns from the single track and takes its siding when the other car throws it in the opposite direction. Both switches are shifted simultaneously each time the cars leave the sidings, opposite to each other and alternately, to connect with one siding and then the other.

To prevent the cable of the down-going car from fouling with the wheels of the up-going car an open trolley wheel is attached low down on the passing side of each car. After the cars pass and come in line on the single track the cable of the car below the siding draws taut against the side of the car above. As the cars become more distant this cable sags and drops into the open trolley wheel, which carries it clear of the car wheels to the top and back, and when the cars take the sidings this cable is lifted out, and as the cars get in line again on the single track the other trolley takes the other cable. In the general view (Fig. 1), the cars drawn in full black lines show the cars at the dump and at the head or intermediate levels. The dotted lines show the cars passing and the trolley wheel of the up-going car taking the cable of the down car.

The two sheaves at the head of the raise are made double and single, both being in the same sheath (Fig. 5). The double sheave has the shaft extended through the sheath with a brake wheel keyed on (Fig. 6). The arrangement (Fig. 5) allows the cable to be passed twice around the double and once around the single sheave, and each end of the cable attached to a car. The double turn around the sheaves increases the friction for braking on a steep incline where a single turn would slip. The points of landing and passing are always the same, and it requires a cable only a few feet longer than the run.

With the double drum at the top it takes twice the length of the run in cable, and considerable figuring is required as to where the cars are going to pass. On drums, if the cable rewinds on itself, the cars will always pass below the center, and if it winds differently on one trip than it does on another, the cars will land much out of place at the top and bottom either on a double or single track.

The cars automatically tip and unlatch the door at the bottom to spill the load in the chute, which is about 30 feet deep. The doors have the common latch bar bolted in the center, the ends engaging reversed hooks on the side of the car body. One end of the latch bar extends beyond the car body and strikes a "bumper" at the dump and unlatches the door.

A short section of the track is hooked up at the ends to receive the car wheels, and swiveled on a frame which tips with the weight of the car, giving it any angle desired. The waste is drawn from the chute and run out the lower level to the main incline to be hoisted to the surface.

A flow of over 300 gallons of water per minute down this raise made track laying and other work anything but agreeable, especially as the work was rushed and experimental. With the able assistance of R. Barry, the foreman, the tramway was put in and working successfully in the short space of two days time.

While the single track will probably never succeed the double track for this kind of underground mining, there are times when, under the same conditions that confronted the Gold Hill mine, this mining jig could be used to a great advantage.

Reviving the Tombstone, Ariz., Mines.

[STAFF CORRESPONDENCE.]

The Tombstone Con. Mines Co., E. B. Gage president and W. F. Staunton general manager, now control the principal mines of the Tombstone district, including the Grand Central of twenty-six claims, the Contention of four claims, the Tombstone M. & M. Co. of eighteen claims, Head Center and Tranquility of four claims and ten other locations. This is claimed to take in about 90% of the properties that formerly produced.

The plans of the management contemplate the installation of a pumping plant at the new combination shaft, now at 569 feet depth, which is water level, then sinking into the ore bodies below water level to determine their character and extent. This new shaft is four-compartment, and pumps of 1700 gallons capacity per minute will be placed at the water-level station. They are to be tandem-compound-triple-expansion. Power will be furnished by four marine type boilers, 22½ tons each, with an 8-inch steam pipe connecting them with station pumps. The 16x60 hoisting engine at the Grand Central shaft is being moved to the new shaft to do the work there. It is the double-reel type, carrying flat cable. The new machinery, including pumps and an air compressor, is expected to be on the ground within a few weeks.

The new combination shaft is on the Flora Morrison ground, near the old Contention shaft, cutting to water level through shale and quartzite. Connections have been made with old workings of contiguous property. The holdings of the consolidation extend along the strike of the north and south belt, carrying parallel ledges which widen and narrow at different points. The vein matter consists of quartz, shale, spar and clay, the pay ore being the shoots, chimneys and chambers. The values are in silver chlorides, free gold and some lead. In the operations of former years the high grades were shipped direct to the smelters, the lower grades milled by free-milling process, the several mills being near the San Pedro river, 9 miles away. The presumption is that the ores below water level will be found to be more of a sulphide in character. The veins of the camp are pretty well opened to the 300-foot level.

When the new company's pumping and hoisting equipment shall be ready for operating, the developments and determinations (of so much importance to Tombstone) will go on rapidly. If the operations and production go forward as expected, it is likely that a railroad will be built to Tombstone. General Manager Staunton spends most of his time at the Congress mine, of which he is also manager; but it is stated that President E. B. Gage will soon be in Tombstone to give the work much of his personal attention. H. J. Gray is Supt. in charge and W. H. Trelease of Oakland, Cal., is directing the mechanical work.

Tombstone, Ariz., Jan. 6.

Copper Statistics for 1901.

Statistician John Stanton announces his copper figures of United States production and exports for 1901, and their comparison with the corresponding figures for 1900 as follows:

	1901.	1900.
U. S. production, pounds	594,171,200	602,082,880
U. S. exports	213,619,840	357,530,880
Home supplies	380,551,360	244,552,000

Reduced to a percentage basis we have:

Decrease in U. S. production	1.3%
Decrease in U. S. exports	40.3%
Increase in home supplies	55.6%

The European production of 1901 at 224,539,840 pounds was the largest on record, and was an increase of 12% over the figures of 1900.

Cement Production in the United States in 1900.*

The amount of Portland cement produced in 1900 increased over 50% over 1899. The average annual rate of increase since 1890 has been about 40%. The value of the product of 1900 was about $1,200,000 more than in 1899. The average price per barrel in 1900 was $1.09, against $1.43 in 1899. There were fifty cement works in 1900, against thirty-six in 1899, twenty-four in 1894 and sixteen in 1890. Pennsylvania and New Jersey remain the chief States of the industry in the country; Illinois and Michigan are making considerable progress; Colorado, Indiana and Texas have the industry on a good basis.

The imports have remained practically constant for the past eleven years, in the face of the immense growth of domestic manufacture. High-grade Portland cement is manufactured more cheaply and of better quality in this country than abroad. The proportion of domestic cement consumed has increased from 13.2% in 1891 to 73.9% in 1899 and 79.1% in 1900. According to the advance sheets of consular reports No. 1052, there is apparently good demand for Portland cement under conditions favorable enough to allow export from this country to Canada, Mexico, Central America, Martinique and the Guianas.

The production of natural rock cement in the United States during 1900 amounted to 8,383,519 barrels, practically the average for the last five years, a loss of 14.9% in amount and 22.55% in value from 1899. The average price per barrel in 1899 was 48.3 cents, and in 1900 it was 44.5 cents. There is a vast field for improvement in the natural cements of this country, and manufacturers of this kind of cement are urged to institute a series of experiments with their raw materials and faithfully to record their results.

The total product of cement in the United States in 1900 was 17,231,150 barrels, valued at $13,283,581, against 15,520,445 barrels, valued at $12,869,142, in 1899, a gain of 11.02% in amount and 3.06% in value.

*"Mineral Resources of the United States, 1900," Dr. David T. Day, chief of division, issued by United States Geological Survey.

Difficult Shaft Sinking, Emma Mine, Butte, Mont.

The reports of A. E. Spriggs, superintendent for the Butte M. & Dev. Co., and in charge of operations at the Emma mine, at Butte, Mont., describes in detail the means taken by him to save the Emma shaft, which threatened to cave in on account of the soft, sliding ground through which it was sunk. In his first report he says: "It has occupied seventy-five days to sink the shaft 16 feet, repair and strengthen shaft, cut a station 14x26 feet, install pumps thereon and run 200 feet of crosscuts and drifts, at an expenditure of almost $11,500."

In his later report, which carried the work up to the first of 1902, he says: "The system of spiling and double setting was continued, using spiling 4x6 inches and 12 feet long, driving them by compressed air, and Oregon fir timbers 12 inches square for the sets, forcing them into place with hydraulic jacks, and tying them firmly together with extra heavy Norway iron hanging bolts. With no solid ground to block timbers to below, all the down weight had to be protected from above, and tons of Norway iron were made into hanging bolts with which to tie the timbers together. The ground that did not come up through the pumps as sand, had to be taken out with extra caution, for, if it got away for a second and made a run, the shaft was lost, and as fast as a shovelful of dirt was removed, timbers in some form had to take its place. This work, of necessity, was very slow. The shaft timbers also required constant attention, as the loose surging ground above would crush in the wall plates, and false ones had to be substituted immediately."

Solid ground was finally reached in the shaft on Dec. 16. "The cost of this undertaking," he adds, "has been very heavy. It has occupied 112 days' time to sink 37 feet, retimber, repair and strengthen the shaft, cut a station 14x26 feet, install a pumping plant therein and run 230 feet of drifts and crosscuts at an expenditure of nearly $16,500. The last 30 feet sunk has cost about $74 per foot. I consider $75 per foot a fair estimate for sinking the remainder of the shaft."

THE specific gravity of commercially pure aluminum varies at atmospheric temperature from 2.56 when cast in sand to 2.71 when hammered or drawn. Compared with other metals, its specific gravity is as follows:

Aluminum	1
Zinc	2.7
Tin	2.76
Cast iron	2.91
Nickel	3.37
Copper	3.37
Silver	3.98
Lead	4.30
Gold	7.31
Platinum	8.15

The extraordinary lightness of aluminum is one of its most striking characteristics. Since the weight of a given volume of a metal may govern its financial value, copper being 3.37 times as heavy as aluminum, it follows that whenever aluminum costs less than 3.37 times copper, it is cheaper, volume for volume.

What to do When the Gas Engine Stops.

By Albert Stritmatter.

It is always very easy to solve a problem in mathematics backwards after you have the answer. Likewise it is very easy to explain difficulties in connection with machinery after you have the cause and how to overcome it. The hard part is when you have the difficulty to overcome and do not know what the cause is or how to find it. Meanwhile the whole or portion of the plant may he shut down and expenses are going on while no work is being done, men are continually coming to ask what the trouhle is, etc. Under such circumstances it takes a cool head to keep one's brain working properly, for everything is in confusion and tends to make one nervous and excited, preventing a solution of the prohlem. On many such occasions further damage is done by reason of not investigating fully the cause of the trouble but guessing at it and then going ahead, with the result that something more serious occurs.

When it is a gas or gasoline engine that is causing the trouhle it is particularly essential to ultimate speed and success in overcoming the difficulty that the work of locating the trouhle he carried on in an intelligent and methodical manner. If it is not done so, the solution of the question will not he discovered unless accidentally. How foolish it is, for instance, when an engine will not start, for a man to lug at it over and over again for hours at a time in a vain attempt to start the engine without undertaking to use his own brains and find out why it does not start. Yet this is done very frequently and the engine is presented as heing a very hard one to start! I should think so. It should not he necessary for a man to go from the factory anywhere from ten to several hundred miles, simply to tell a puzzled engine operator to renew his hatteries, to replenish his gasoline tank, take a brick off his gasometer, to use more or less gasoline or lubricating oil, or to repack his gasoline pump, etc. Yet this has been done many times and is heing done continually for all these and many other equally as foolish reasons. And to cap the climax, in almost every instance the operator has had and has been supposed to read and study a book of instructions giving particular cautions on these various subjects.

Let us suppose we have an engine which has suddenly stopped running. We are sensihle and know that the engine has done so because of some legitimate reason, and so we will not lug at the fly wheels in vain or telegraph for a man from the factory the very first thing, meanwhile sitting around and cursing ourselves for ever having allowed ourselves to be persuaded into buying such an engine. We will sit down and think a little about how the machine operates.

First, we know that the engine must have fuel in sufficient quantities and in the proper proportions. By fuel we know is meant not only gas or gasoline but also air, for air is as essential to proper results as is the gas or gasoline. Second, we know that after the fuel is drawn into the cylinder it must he properly compressed to give greater power and assist in rapid comhustion when the charge is ignited. Third, we know that the compressed charges must be ignited, and fourth, we know that the hurned charge must be exhausted. Whatever interferes with this process will result in stopping the engine entirely, or at least in decreasing its power and increasing the fuel consumption per horse power actually developed. Besides the process mentioned we know that the engine must be properly lubricated, adjusted, have a proper cooling system, etc., in order to perform its functions with the greatest economy.

Let us see, then, whether our engine is getting the proper supply of fuel. First, we will work our gasoline pump by hand and see if plenty of gasoline reaches the engine. If it does not, there may be no gasoline in the supply tank, the suction pipe may not be air tight, the check valves may not seat properly, or the pump may need repacking. But even if the gasoline reaches the pump it may not get into the cylinder of the engine. There are a great many devices for this purpose and each may cause peculiar troubles of its own. The operator should understand his device thoroughly and see that it is kept clean and in proper condition so that its operation will be perfect.

If we have a gas engine, we will see that our gas meter, gas hag or gasometer, gas regulating valves, etc., are in proper condition. Too small a meter may cause trouhle. Sometimes a man will take a gasometer to pieces and put it back so that it shuts when it should open, and vice versa.

Then we will see if our air supply is all right. There are different methods of supplying air to engines. Sometimes they draw air from under the hed, sometimes through a long pipe from the outside of the building. In the latter case obstructions are apt to get into the pipes unless the end of it is protected. In one case a newshoy's hat was sucked into the pipe and stopped the supply of air.

Feeling sure, now, that our engine is supplied with gas or gasoline and air in sufficient quantities, we must be sure that the quality and proportion are right. Water in gasoline causes a great deal of trouble. Gasoline which has been allowed to stand and let the lighter and more inflammahle gases evaporate also causes a great deal of trouhle. Gas which has been too liberally supplied with air, either intentionally or otherwise, will cause difficulties, as will water in the gas supply pipes. Then the proportion of the gas or gasoline to the air must he correct. This is governed hy various devices and the instructions from the manufacturer should give sufficient information on this suhject to enable the operator to make these adjustments properly. The color of the exhaust will indicate pretty clearly whether a proper proportion is being secured. The exhaust will he practically smokeless when the proper mixture is secured. Smoky exhaust indicates improper comhustion and results from too much gas or gasoline or from too much lubricating oil.

If we have not located the trouhle yet we will try the compression. By pulling hack on the fly wheels and holding against the compression a few minutes, we can tell whether or not it is all right. If it is not, it may he due to several things. Some of the piston rings may he broken. Or they may he stuck fast into their grooves as a result of too much luhricating oil, and thus fail to hold the compression. Or, the piston and cylinder may be worn to such an extent that it is impossihle to get a good compression. Or the exhaust or fuel valves may fail to come to their seats properly, which may be due to their needing regrinding, or because the valve stems are stuck with burned grease and oil. The valves should he reground to their seats with emery flour and oil, and the stems and hearings in which the stems work should be thoroughly cleaned up. Or, the lever or other devices opening the valves may be so out of adjustment that the valves are not permitted to come clear down to their seats. The power developed hy an engine depends to a very large extent on the compression, so that this is a very important point. As the highest pressure developed hy the explosion is approximately four and one-half times the pressure of compression, it will be seen how vitally the compression affects the results secured.

Having a proper fuel supply and a good compression, we now come to the question of ignition. This is a very extensive question and one of vital importance to the gas engine operator. Space will not permit in this article a detailed discussion of the question. Instruction hooks of manufacturers generally devote considerable space to this suhject and it will pay the operator to become as familiar with the suhject as possihle, for his knowledge of this question will determine the success or failure of the engine. The batteries, of course, must be strong, the connections from cell to cell and from hattery to engine must be properly made. The spark coil must be kept dry. The igniter points must he clean and make a perfect contact. The igniting mechanism must he operated at the proper time and in a proper manner. This applies to all kinds of electric igniters. If a tuhe igniter is used, the tube must he of proper length. If it is iron, it must not he allowed to remain until it is oxidized too greatly on the inside.

The igniter of a gas or gasoline engine is frequently referred to as its "soul," which indicates how important it is. There is, however, a very close connection between the spark or flame and the charge of fuel. Frequently when ignition does not take place a great deal of time is spent in tinkering with the igniter or the batteries while the real trouble may be in the charge of fuel. As has been mentioned hefore, gasoline which has water in it will cause no end of trouhle. While the oil companies, of course, deny diluting the gasoline with water, and the dealers or retail stores just as persistently claim that they are not guilty, it is frequently done hy some one. It can generally he discovered hy spattering a little of the gasoline with your finger onto a flat piece of iron or something of that kind. If there is much water in it, there will be little glohules of the water which will separate from the gasoline. Otherwise, the gasoline will spread out smoothly all over the iron. While this does not always disclose the presence of water in gasoline, it will frequently do so. This is a difficulty which it is often very hard to locate because the mixture is apparently all right, as is also the compression and the spark, and yet the engine will not ignite.

Many people, too, see no reason why they should not connect call bells, etc., to their engine battery. This may be successful for a while but will result in the battery giving out much sooner than it otherwise would, the result being that they have to he renewed more frequently. It is much cheaper in the end to provide separate hatteries for call hells and let the gas engine battery serve for the one purpose of igniting the engine charges. It should also be remembered that the hattery should not he put on a shelf and tin cans and other ruhhish piled on top of it. If this is done trouhle will result from short circuiting the battery.

Another thing to be remembered in renewing "wet" batteries is that new solutions as well as new plates should he put in. Frequently people will put new solutions onto old plates, or new plates into old solutions, with the result that no good is done. Battery manufacturers usually arrange the quantity of the various parts of their cells so that they deteriorate together, and it is therefore useless to renew only a portion of them. Ahove all, do not forget to open the switch when the engine is not in operation. Failure to do this results in wearing out the hattery more in a single night than for many months of continuous use.—American Manufacturer.

Mining at Bisbee, Ariz.

[STAFF CORRESPONDENCE.]

The Bisbee copper belt has a northwest and southeast trend within a lime formation, hut adjacent to a well-defined porphyry dike, which also strikes northwest and southeast. The ore hodies within the lime helt have an irregular shape in many places, resulting, apparently, from intrusions of porphyry from the main dike. The depositions of copper apparently were made in the contact hetween porphyry and lime, chiefly penetrating the latter. The strata which are thus mineralized pitch toward the southeast. This is proven to he true by the workings at different points along the strike of the helt. For instance, in the Copper Queen's Czar shaft, near the smelter, the ore was reached at about 200 feet depth, and the ore was struck at greater depth in each consecutive shaft as development proceeded southward along the helt.

On the Calumet & Arizona group of eleven claims,

Prospecting Rig Copper Glance Mine, Near Bisbee, Arizona.

adjoining the Copper Queen proper on the southeast, the main ore hody was opened at the 750-foot level. On the Lowell group, still southeast of the Calumet, the ore was reached at 1050 feet depth. Thus there seems to be a non-mineralized lime capping overlying the main ore hody, though there are croppings of ore at various points.

The most important development on the helt south of the Copper Queen is that of the Calumet & Arizona, which has a vertical shaft 1120 feet deep, with drifts from it into the ore body at the seventh, eighth and ninth levels, in all aggregating ahout 2 miles of work, exposing large bodies of ore that will average at least 7% copper. The bulk of this ore belongs in the oxidized class, being carried in an altered lime, and associated with talc, oxide of manganese and hematite, the manganese making a desirahle fluxing material. There are some sulphides on the ninth level and from the tenth down the shaft is in a good grade of chalcopyrite ore. In many places there are copper oxides that run very high, and on the eighth level copper glance was found that ran 41% copper.

A pump will soon be installed at the 1100-foot station to keep the work clear of water. At the surface a first-motion, double-drum hoisting plant and a duplex compound air compressor are being put in,

and a third compartment is being added to the shaft. It is intended to put in a triple-deck cage.

Supt. I. L. Merrill states that the Calumet & Arizona Co. will erect a 300-ton smelting plant at Douglas, 26 miles southeast of Bisbee, on the El Paso & Southwestern Railway, and that the equipment for it has been ordered. The plant will be enclosed in a steel structure of sufficient size to hold a 500-ton smelter. At Douglas the water supply from wells is said to be ample for all purposes.

The Lowell, lying south of the Calumet, now belongs to the Copper Queen Co., who are thoroughly developing the large bodies of oxidized and sulphide ores that were uncovered some time ago between the 1000 and 1100-foot levels.

Immediately southeast of the Lowell is a group of nine claims, believed to be on the same belt, which belongs to and is developed by the Calumet & Pittsburgh Co., comprising the same persons that control the Calumet & Arizona.

The porphyry dike which cuts through the Bisbee lime belt is believed to be traceable several miles in a southeasterly course. At any rate, there is development in progress at and around Bald mountain, 7 miles southeast from Bisbee, where there are fine showings of copper in lime, porphyry and quartz-conglomerate. A great deal of the ore here is copper glance, being specially visible in the porphyritic rock and quartzite which form the outcropping dike. Adjacent to this, in the lime, the croppings and shallow workings disclose a good deal of oxidized copper ore, as well as glance. This portion of the belt is covered by twenty-four claims belonging to the Copper Glance Co., organized by Bisbee people—C. W. Clawson, I. L. Merrill, C. C. Warner, C. L. Beckwith, James Wood and G. E. Tomlinson being interested. The locations were made nine years ago by John Connolly, who is a stockholder. Six or eight shallow shafts have been sunk and a large number of open cuts made, which show a wide dissemination of ore through the belt. One prospecting shaft, illustrated herewith to show the simple rig used in such work, is in conglomerate and lime, the idea being to crosscut from this to the main ore body. This camp is near Glance station, on the El Paso & Southwestern Railroad.

Adjoining this group are the seventeen claims of the Bisbee Consolidated Copper Co., located on the same belt and having practically the same conditions.

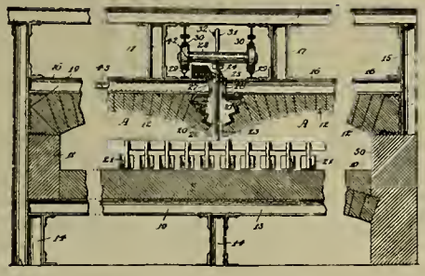
Bisbee, Ariz., Jan. 4.

Mining and Metallurgical Patents.

Patents Issued January 28, 1902.

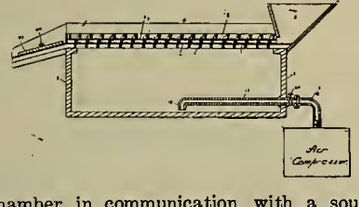
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

ROASTING FURNACE.—No. 691,787; W. A. Lorenz, Hartford, Conn.



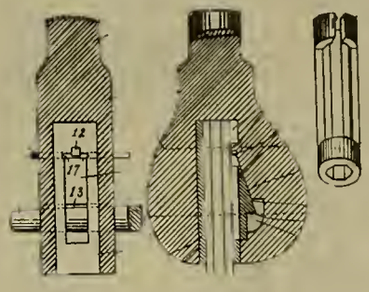
A roof composed of a plurality of arches which are separated from each other by a slot extending longitudinally of furnace; I-beams disposed above each section, thrust members secured to beams, for independently supporting each section from said beams; girders extending laterally of furnace; means for supporting I-beams from girders; means for supporting girders near ends thereof; a stirrer mechanism having an arm projecting through slot into hearth; and means for moving mechanism longitudinally of hearth.

ORE SEPARATOR.—No. 691,819; J. J. Snider, Xenia, Ohio.



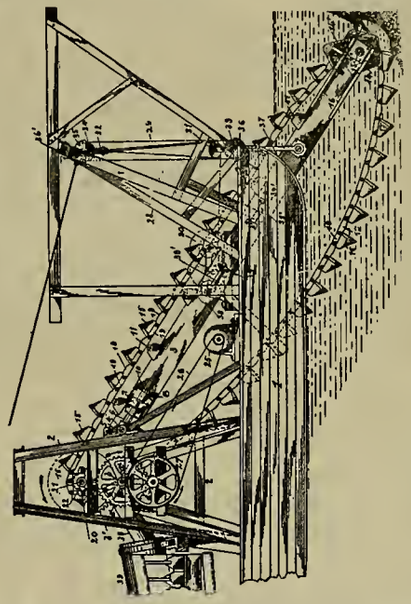
A chamber in communication with a source of pressure, a supporting frame across top of chamber, a perforated bed or covering on frame, a series of diagonally-arranged strips above covering, and a second series of oppositely arranged strips above first leaving a horizontal channel between lower strips extending from side to side throughout length and width of frame, while upper strips extend throughout width of upper half of frame and only partially of width of lower half.

ROCK DRILL CHUCK.—No. 691,985; W. Terry, Oakland, Cal.



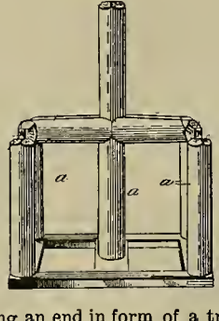
A chuck having an axial socket or cavity for drill bit and having a downward extension with a surface sloping upward rearwardly, a shell or sleeve fitting in socket, a block in lower part of socket and having a rear upwardly sloping lower surface to slide on sloping surface of extension and act as a wedge, chuck being also apertured transversely through extension block having a shoulder extending into aperture, and a wedge or key in transverse aperture engaging shoulder to shift block rearwardly and thereby clamp drill bit, chuck being also apertured transversely in rear of rear end of block whereby a suitable pointed instrument may be inserted to remove or loosen same.

EXCAVATING MECHANISM FOR DREDGERS.—No. 692,030; R. H. Postlethwaite, San Francisco, Cal.



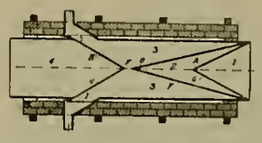
The supporting frame, ladder pivoted thereto, tumbler working within bearings of supporting frame, means for imparting rotation to tumbler, roll or drum working in bearings at lower end of ladder, endless carrier working over roll or drum and tumbler, excavating buckets secured to and carried by endless carrier, a series of fingers projecting from tumbler and between which endless carrier works, of devices for imparting longitudinal movement to supporting ladder so as to regulate tension of endless carrier, guard plates attached to lower end of side pieces of ladder, and means whereby supporting ladder is raised and lowered.

MINE TIMBER.—No. 692,111; D. W. Brunton, Denver, Colo.



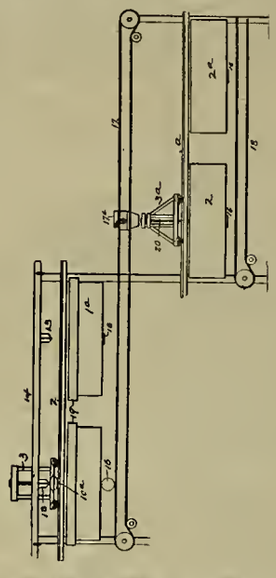
A post having an end in form of a truncated pyramid, a cap also having four inclined sides and a tenon provided with top and bottom and shoulders, and a girth also having four inclined sides and a tenon having top and bottom, sides of these three members and tenons being capable of being cut by appropriately feeding timbers to a gang of fixed saws appropriately arranged.

GRAVIMETRIC ORE ROASTER.—No. 691,868; J. A. Ogden, Philadelphia, Pa.



A furnace, an inclined, freely swinging roasting plate situated in furnace, provided with a superimposed concentrating plate secured to and moving with roasting plate but separated therefrom, a V-shaped bridge upon concentrating plate, an outlet near lower part of V leading through concentrating plate to roasting plate, means for swinging plates toward higher end of plates, and abutments placed to stop suddenly swing of plates in other direction.

APPARATUS FOR HANDLING TAILINGS.—No. 692,108; H. W. Blaisdell, Yuma, Ariz.



Two series or sets of vats disposed in different planes, traveling bridges located above each set or series of vats, a distributer for tailings carried by upper bridge, a combined distributer and excavator for tailings carried by lower bridge and means for carrying material from upper series of vats to lower.

SEPARATING PROCESS FOR ORES.—No. 692,008; O. Frolich, Charlottenburg, M. Huth, Halensee, and A. Edelmann, Charlottenburg, Germany.

The process which consists in heating ore to a temperature below decomposing temperature of sulphate of metal to be sulphated, but above decomposing temperature of any other metal existing in ore and then passing over it a heated and dry mixture of sulphur dioxide and air, then separating resultant sulphate and repeating above steps for another of metals and so on, then leaching ore with water and repeating above steps for another of metals and so on.

PROCESS OF RECOVERING ZINC FROM SULPHIDE ORES.—No. 692,148; H. F. Kirkpatrick-Picard, London, England.

Mixing the unroasted ore containing zinc with a basic material capable of combining with sulphur, and carbonaceous material suitable for coking, forming mixture into briquettes and distilling briquettes in such conditions that they are first coked into coherent masses, and finally zinc is reduced and volatilized, while resulting sulphide is retained in minute particles throughout coke.

A DISCOVERY of gold-bearing conglomerate is reported as having been made in Indian creek, near Dawson, Yukon Territory. There is no reason why gold-bearing conglomerate deposits should not exist in the Klondike country. The extravagant claims of extent of the deposit are not, however, to be accepted. While conglomerate beds containing gold can have a considerable superficial extent, the knowledge of their mode of origin is sufficiently exact to state with certainty that a few feet is the limit of possible depth of payable values. Any first report of a mining discovery from the distant north must be accepted with reserve. In no case are the first examinations of original discoveries as complete and comprehensive as the reporters of them and the writers of newspaper headlines declare.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

COOK'S INLET.

F. E. Dowling, manager of the Aurora G. M. Co. of New York, which is operating on quartz properties at Aurora, on Cook Inlet, says of the mines that they consist of eight claims, on which sufficient development work has been done to justify a 20-stamp mill, which will be installed this summer. The mill will be operated in the summer by water power and during the winter by steam power. The ore they are taking out now yields about $15 a ton. During the past year they have constructed a dock near the property and installed a number of other improvements and it is contemplated to put in a smelter.

KETCHIKAN.

Work on the Laskawonda G. & C. M. Co.'s property at Ketchikan is progressing under Supt. Shoenhar. The shaft is going down in the ore body, which it is claimed shows improvement with depth. The deposit is of large size, some of it carrying high values in gold and copper. Col. Shoenbar goes to the States soon to buy a large dynamo and suitable hoisting machinery, which he hopes to install in May.

The Valparaiso G. M. Co. at Dolomi, Prince of Wales Island, recently shipped fifty-four tons of ore which yielded something over $14,000.

KOYUKUK.

Advices from Rampart give good accounts of the new Koyukuk district, of which Beetles City is at present the center. From Nov. 12 to Dec. 2 the population of Beetles is stated to have jumped from 300 to 700 people. Stampedes to outside creeks and newly discovered ground were of daily occurrence. Provisions were short and food was also short at Rampart. Four creeks in the district are noted as giving rich returns. They are Lane, Olson, Hoglund and Glen. One miner on Glen creek is said to have picked out a nugget weighing $601, and other men are taking out pans running from $1 to $70.

ARIZONA.

GRAHAM COUNTY.

C. M. Shannon of Clifton, the original owner of the property now owned by the Shannon Copper Co., sold it to the company in 1899, and since then the mine, which altogether comprises forty claims, has been extensively developed. The smelter plant is expected to be in operation by April. The plant at the start will treat on an average of 350 tons of ore daily with both furnaces going, and the product for the current calendar year should be about 8,000,000 pounds of refined copper. Later, when the converter and concentrators are added, a tonnage of 700 tons daily will be treated, expected to bring the product up to 20,000,000 pounds per annum.

MARICOPA COUNTY.

At Wickenburg the Oro Grande M. Co. will install an 80-stamp mill. The Socorro M. Co. is now putting in a 20-stamp mill. The Sahuaro is sinking. Work has been started on the Lorna Doone by London capitalists who recently secured that group. The company having the Angel group are working away and are making arrangements to install a 12 H. P. gasoline hoist.

MOHAVE COUNTY.

Control of the Gold Roads group of gold mines near Kingman, lately bought by C. K. McCornick and associates of Salt Lake City, Utah, has been sold in Paris, where the company will be reorganized. G. Kislingbury is superintendent at the mine.

SANTA CRUZ COUNTY.

F. N. Cox, Supt. of the Buena Vista M. Co.'s properties near Nogales, says eighteen men are employed, and there are now some 750 feet of tunneling completed, exposing ore bodies. Electric drills are to be installed and sinking started.

The Pena Blanca M. Co., near Nogales, has ordered a new 12 H. P. gasoline hoist with a capacity for sinking 500 feet. J. S. Hurst, manager, states that the shaft, now down 100 feet, will be sunk 500 feet.

Vance, Carothers & McDonald have leased the Hermosa mine and mill at Harshaw and have started work on the mine, on which they propose to do development work.

YAVAPAI COUNTY.

The Hurricane group of mines in Copper basin, near Prescott, has been sold by D. Walker and S. H. Anderson to L. D. Philips, representing Douglas, Lacy & Co. The Hurricane is a gold group, carrying, it is claimed, about $17.50 gold and eleven ounces silver per ton and 3½% copper. There is a 40-foot shaft and three other openings along the vein. The purchasers, it is stated, will commence immediate development work on an extensive scale.

The Copper Basin G. & C. M. Co. of Prescott owns a group of seventeen claims near Prescott. W. W. Munds is president and superintendent and C. E. Snider is secretary. The company has constructed a hoarding house, two hunk houses, a blacksmith shop, a shaft house and a whim. On the mines over 300 feet of development work has been done, the new working shaft being down 85 feet, and other shafts varying from 30 feet down to 10 have been sunk.

Work on the Brooklyn mine, near McCahe, has developed a fine body of free milling gold ore. The Brooklyn M. & M. Co., of which A. V. Miller is president and superintendent, has in opening up the mines sunk the main shaft 170 feet and has drifted 300 feet in ore. The company has bought a 10-stamp mill, engine, boiler, ore crusher, etc. Water for milling will be pumped from the mine.

A strike is reported made in the properties of the Monarch G. & C. Co., near Jerome. The mine is a free gold proposition, and at a depth of 350 feet a drift cut 4 feet of ore, which assayed $28. The strike was made in the Eclipse claim. There is a large tonnage of ore in the bins ready for the mill, which is nearly ready to start up.

A strike has been made in the Mineral Belt mine, in the Harrishurg district, west of Martinez. The property is owned by the Arizona Development Co., O. L. Gier manager. At 500 feet down a body of ore has been crosscut 28 feet wide which assays from $10 to $15 per ton.

CALIFORNIA.

AMADOR COUNTY.

A new compressor has been installed at the Shenandoah mine, near Plymouth, of which S. K. Thornton is Supt. The shaft is now down about 500 feet, with sinking for the 1000-foot level in progress. Power drills are to be installed soon.

The new shaft on the Boot Jack mine at Plymouth is down 100 feet on an east and west ledge, the development showing up well.

On the Plymouth Rock, formerly the Price mine, 3 miles north of Plymouth, J. H. Durst Supt., there are several veins. Mr. Durst has started to crosscut the formation by running a tunnel through the claim, and is now in about 300 feet. It is expected to crosscut the various croppings at a depth of less than 200 feet below the surface.

BUTTE COUNTY.

J. C. Gray of Oroville has lately discovered a gold mine on his farm in the midst of a peach orchard. The ledge is about 4 feet wide and an assay shows the ore to go $68.31 per ton.

CALAVERAS COUNTY.

The development in the Moon copper mine at Buena Vista, at a depth of 45 feet in the shaft, has opened a vein of ore that assays $21.60 to the ton in gold, silver and copper. At the annual meeting of the Moon G. M. Co., at Valley Springs, W. H. Mitchell was elected president, Bank of Amador treasurer and W. Holmes secretary. The directors determined to sink 100 feet by contract, and called for bids for sinking the next 50 feet.

EL DORADO COUNTY.

On the Montezuma mine at Nashville, on the Mother Lode, the 10-stamp mill is running on rich rock from the 300-foot level. The seam near the hanging wall in this mine, it is claimed, will run $30 to the ton. The ledge, which is about 4 feet wide, will average nearly $9 a ton.

A. Harpending, manager of the Union mine near El Dorado, is preparing to start up and has made an arrangement to work from the Church mine by drifting on the lower level of the latter toward the Union mine.

KERN COUNTY.

Supt. McMahon reports the latest cleanup of ore from the Butte lode at Randsburg, worked at the Red Dog mill, as $8750 from 103 tons, an average of about $85 per ton. Four-fifths of this ore came from the development work in the new drift, the remainder from the lower workings in the Philadelphia Wedge, the property immediately adjoining and which the Butte Co. recently bought.

MARIPOSA COUNTY.

The Mariposa Electrical & Power Co., whose works are to be on the Merced river about 9 miles above the Benton Mills, propose to begin the construction of a dam at once for the purpose of securing power to operate an electric power plant. The dam is to be constructed of solid masonry and concrete and will be 30 feet high. The flume will be 7 miles long, 12 feet wide and 6 feet deep. The water turned in at the headgate will be carried to a power house 2 miles above the Benton Mills and used there under a head of 275 feet, which will operate a generator of 3000 H. P. The flume will cross Sherlock creek near its mouth, and a steel and iron trestle 200 feet high and 900 feet long will be built there. The cost of construction of the dam and flume is estimated at $750,000.

A new station has just been finished at the 1250-foot level in the Princeton mine shaft at Princeton. The station is 30x30 feet and 16 feet high, with a shoot 25 feet deep which is 20 feet across the top. Eight men were employed on this work for twenty-eight days. The quartz taken from the station, it is stated, more than paid the expenses of the work of excavation. The mine is operated by the Mariposa M. & C. Co.

NAPA COUNTY.

The statement of the Napa Con. Q. M. Co. for 1901 shows: Total cash disbursements, $163,154.36; total payroll, $138,390.98; ore mined and treated, 33,930 tons; quicksilver produced, 4800 flasks, 367,200 pounds; average yield, percentage, .00541; cost per ton of mining ore, $2.82; cost per ton of mining ore, including development work, $3.50; cost per ton of mining ore and reduction, including general expense, $4.60; cost per ton of ore reduction, 66 cents; amount of tunnels, drifts and winzes excavated by contract, 9488 feet; cost per foot, $2.43.

The statement of the Ætna Con. Q. M. Co. for 1901 shows: Total cash disbursements, $16,867.83; total payroll, $11,598.60; quicksilver produced from cleaning furnaces, 228 flasks, 17,442 pounds; tunnels and drifts excavated, new work, 1995 feet; old tunnels opened, 4384 feet; old winzes opened, 83 feet; cost per foot for new work, $4.97; cost per foot for opening old works, $1.05. The quicksilver produced was all from cleaning up condensers, no ore being mined or treated during the year. The mine work has been entirely for development to open up new ore body discovered through shallow surface workings.

The statement of the Boston Q. M. Co. for 1901 shows: Total cash disbursements, $83,383.55; total payroll, $61,420.39; ore mined and treated, 19,045 tons; quicksilver produced, 1545 flasks, 118,192½ pounds; average yield, percentage, .0031; cost of ore reduction per ton, 61 cents; cost of mining per ton, $2.14; cost of mining per ton, including development work, $2.58; amount of tunnels, drifts and winzes excavated, 2507 feet; average cost per foot development work, $2.50; reopening and timbering old works, 871 feet. A new furnace was completed and put into service, the old furnace having been closed down to be repaired during the coming year.

NEVADA COUNTY.

Manager Mark B. Kerr of the Grass Valley Exploration Co. says that ore averaging not over $3.50 a ton will be worked at a profit at the W. Y. O. D. mine during the current year. At present the cost at the mine of mining, milling and administration is $4.35, against $3.85 for the same time last year. The additional expense is on account of long hauls and extra handling of ore in the Crescent "go-devil" raise. The semi-annual cost sheet of the W. Y. O. D. mine of the Grass Valley Exploration Co. shows the following results from August 1 to December 31, 1901:

Mining, per ton	$3 43
Milling, per ton	64
Office and administration	28
Development	1 13
Total	$5 48

At the Federal Loan mine in Willow Valley, near Nevada City, the miners who have a lease on the property have made an upraise from a drift off the 300-foot level into a bunch of high-grade ore, which shows free gold. The lessees will start the mill and crush the ore. The shaft at the Federal Loan is about 800 feet in depth.

Whilden, Hawke, Cleveland, Marowich & Calanan have taken a lease of the Tilley mine, Nevada City, and have commenced operations. The Tilley mine was formerly called the Midnight mine, and for the past few years has been worked by tributers in surface workings.

C. Brockington, Supt. Orleans M. Co., Nevada City, says that he has struck the Heuston Hill vein, and pay rock has been encountered. The drift will be continued 100 feet, to connect with the old Heuston Hill property, which will give them 300 feet of backs.

Supt. Bray reports that at the Posey mine in Willow valley, near Nevada City, a good ledge has been struck at a depth of 140 feet.

W. Floyd and F. Searles of Nevada City, owners of the Santa Rosa claims on Canada Hill, and W. H. Bray, Supt. of the Posey mine in Willow valley, have made an agreement by which the three will develop the Santa Rosa mine, W. Floyd to be the Supt. There is a tunnel about 75 feet in on the mine, and this is to be extended 500 feet farther. Inside of 200 feet it is expected to cut the first ledge and a few hundred feet farther in a second vein.

President H. E. Averill, R. D. Jackson and D. R. Finlayson of the Yuba M. Co., owning the Yuba mine at Mayhert, state that work will be resumed on the mine on a much larger scale within a short period.

Operations have been resumed at the California or Gold Tunnel mine, near Nevada City. Supt. E. Lawrence is arranging for installing an entirely new hoisting and pumping plant of capacity to sink the shaft to a depth of 2000 feet. The present plant was merely erected to pump out the mine to a certain depth, retimber the shaft and make tests of the ore. As soon as the heavier machinery is in place pumping and sinking will commence, using electric power for both. The shaft is now down 540 feet.

PLACER COUNTY.

The 20-stamp mill and trolley cars on the ore tramway at the Three Stars mine at Ophir have commenced running.

SAN BENITO COUNTY.

The annual statement of New Idria Q. M. Co. for 1901 shows: Total cash disbursements, $169,855.65; total payroll, $101,480.56; ore mined and treated, 31,866 tons; quicksilver produced, 4800 flasks, 367,200 pounds; average yield, percentage, .00576; cost of ore reduction per ton, 64 cents; cost of mining per ton, including development work, $1.82; tunnels, raises and drifts excavated, 1422 feet; cost per foot development, $4. A new furnace has been erected and put into service during the past year.

SAN LUIS OBISPO COUNTY.

At the Oceanic quicksilver mine, near Cambria, there is a large quantity of high-grade cinnabar on the dumps awaiting reduction. A furnace is under construction and nearly completed.

L. J. Sinnard has sold to Paso Robles people a large group of quicksilver claims at Adelaide. A company has been incorporated to develop the property.

E. Ladner, of Paso Robles, has sold eighty acres of cinnabar-bearing land, 12 miles west of Paso Robles, for $10,000 to J. Stevens, representing Los Angeles people, who project the erection of a $15,000 reduction plant at once. Croppings, assaying 30% quicksilver, have been taken from the ledge, but it has never been developed.

At the Klau mines, near Paso Robles, about 200 flasks of quicksilver are being produced monthly. About seventy-five men are employed. Machinery and a reduction plant, representing the expenditure of over $100,000, have been installed during the past year. About eighty or ninety tons of ore are worked daily.

SHASTA COUNTY.

The Shasta May Blossom M. & S. Co. is developing a mining property at De Lamar. M. Lindley is manager.

SIERRA COUNTY.

At the York mine in Slug canyon, near Downieville, J. W. Finney has seven men at work sinking the shaft and constructing a shaft house.

The Swansee gravel mine at Chipp's Flat, near Alleghany, has been worked intermittently for forty years. A tunnel started nearly that long ago to tap the gravel channel, now in a distance of 2200 feet, is to be advanced to the channel by J. Brock, H. B. Budd and F. Godfrey, who have a bond on the mine. They estimate that another 150 feet will reach the channel.

SISKIYOU COUNTY.

The Snoozer ledge on Russian creek, near Etna, owned by Clark & Wyke, has been bonded by H. Finley of Sawyers Bar and a local company has been organized to take hold of the property and commence opening it up.

The Weideman & Williams ledge, on North Fork of Greenhorn, near Yreka, is to be reopened by E. Northcutt, who has bonded it.

TRINITY COUNTY.

The Oriole quartz mine, discovered last spring, about 2½ miles from Indian creek, is being developed by the owners—Paulsen, Leininger & Morris—by running tunnels, from which ore is coming out. The ledge is about 3 feet in width and carries free gold, running from $10 to $200 a ton. In the spring an arrastra or small prospecting mill will be erected.

At the annual meeting of the Last Chance G. M. Co., held in Philadelphia, Pa., on January 13th, the following were elected directors: J. H. Woodside, G. H. Colket, I. Levin, J. S. Keith, H. Hile, C. C. Shubert, J. W. Teitsworth, C. R. Fulmer and J. C. Hile. The company operates the Paulsen-Hughes mine on the Trinity river, near Weaverville.

TUOLUMNE COUNTY.

E. B. Burdick of Meyer's Falls, Wash., and Mr. Rigg of Spokane, Wash., have

bonded the McAlpine mine, near Big Oak Flat.

The Campo Seco G. M. Co. are calling for bids to sink a double-compartment shaft 115 feet on their property near Jamestown.

The Union Trust Co. of San Francisco has deeded the Pino Blanco quartz mine, at Pino Blanco, to P. P. Chamberlain and J. L. Ross for $1000.

At the Olson mine, near La Grange, the Santa Cruz M. Co. has five men employed. Five carloads of copper ore have been shipped with satisfactory returns. A steam hoist is to be installed.

COLORADO.

BOULDER COUNTY.

The Gold Lodo mine has started up again. From the 100-foot level they have started to upraise to make an air shaft. George E. Blaisdell is manager.

Work has been commenced on the construction of a 100-stamp mill at Hicks gulch, near Wall Street, by the Boulder County M. Co.

CLEAR CREEK COUNTY.

The Red Oak G. M. & M. Co. mill at Georgetown was destroyed by fire on the 25th ult. A B. Montgomery, secretary of the company, states that the company will erect a concentrating mill with a capacity of 100 tons to replace the one destroyed. The work of rebuilding will be started at once. The mill was totally wrecked by the fire, and all the former machinery will be replaced by machinery of the latest type.

GILPIN COUNTY.

New England people are interested, as the Atlantic Mines Co., in doing surface work on four claims, near Central City. F. Totnam is in charge of the work.

The Town Topics G. M. Co. at Central City has paid its fourth dividend of one-half cent a share, amounting to $5000, and $20,000 for the year. An average force of thirty-five men is employed and regular shipments are being made.

Ore carrying copper and a total value of $110 per ton has been found in the 210-foot east level of the Ingalls mine at Central City.

The Mingo M. Co., through its secretary, J. M. Short of Denver, has bought the Williams crossing lode, near Central City, from Mrs. A. Drake & Co. for $1000. A contract has been let for sinking the 210-foot shaft 100 feet deeper. L. Drake is Supt.

G. Zancanella and others of Russell have sold to the Argo M., Dralnage, Trans. & T. Co. (better known as the Newhouse tunnel), a three-fourths interest in the Elizbone and Trentina lodes at Russell for $1600.

During the third week of January the shipments of smelting and crude ores, mill tailings and concentrates from Black Hawk to the smelters and Idaho Springs mills were eighty-three cars, or 1535 tons.

At the Wautauga property of the Calumet G. M. & M. Co., near Central City, development work is being done under J. Clayton, manager, the work being principally confined to the sixth and seventh levels, upraising to make a straight shaft to the surface. The daily shipments average two cars.

The Little Sunshine G. M. Co. has been incorporated by E. Pryce, S. W. Whitelock, L. W. Kimball, T. J. Sipple, O. Wisby, L. E. Lewis, J. B. Matthews, H. P. Kellogg, J. Lawcook and A. S. Culbertson, all of Boulder, with a capital of $500,000, to mine near Central City.

The Opal M. Co. of Cripple Creek has been incorporated to operate the Castle Rock property, situated in Chase gulch, near Central City, and the work will soon be commenced.

GUNNISON COUNTY.

At the Citizen and Maid of Athens mines, near Pitkin, the shipments at present average 550 tons per month. The ore from the Maid of Athens it is claimed averages fifty ounces in silver and $2.50 in gold. The Citizen ore runs eighty ounces in silver and from $4 to $5 in gold per ton. The Maid of Athens is owned by T. Huxtable and W. Friend of Pitkin and H. A. Frambach of Denver. The Citizen company is controlled principally by J. C. Osgood of Pueblo.

The New Sylvanite M. Co. has been incorporated, with office at Monmouth, Ill., to operate the Sylvanite group at Gothic. J. R. Hanna is president and J. F. Searles secretary. The Sylvanite mine has over 5000 feet of workings. The mineral is a high-grade silver product, the shipping ore, it is claimed, netting on an average $500 per ton.

The Congress G. M. & M. Co. of New York has bought the Comstock, Joe and Belvedere lodes, near White Pine, from F. A. Potter for $2000, and intends to do extensive work during this year, for which it is reported to be arranging.

The Tomichi valley lead smelting plant at Cosden, near White Pine, it is reported, will resume operations. The company operating this plant is composed of Boston and Ohio people. They are developing some lode claims at White Pine.

HUERFANO COUNTY.

The Copper Bull M. Co. has been incorporated at St. Louis, Mo., to operate twelve claims, including the old Copper Bull mine on Pass creek, near Walsenburg. Old development work shows five veins of copper ore running from 10% to 15% in copper, with considerable gold. C. O. Unfug of Walsenburg is manager.

LAKE COUNTY.

The Graham Gulch M. Co. has been incorporated, capital $100,000, by J. M. Maxwell, A. Dyatt and G. H. F. Meyer, to operate the Star of the West mine at Leadville. The intention is to put a shaft down at least 500 feet after sulphides. Mr. Maxwell is manager.

OURAY COUNTY.

The Saratoga Pyritic Smelting Co. has been incorporated to erect a smelter in Ironton, near the Saratoga mine, by E. F. Anderson, E. C. Rhodes, F. E. Brophy, E. H. Mather and W. J. Sawyer, the last named of Leadville. The capital stock is $250,000. The Saratoga mine, L. R. Fry manager, contains large bodies of low-grade ores, which could not be worked, owing to the expense of transportation to railroad, and the smelter is projected to handle them.

J. J. Carmichael of the Blaine mine, near Sneffles, says the crosscut tunnel being driven to intersect the Blaine and Homer veins at a depth of about 2200 feet from the surface, after being driven 1400 feet, cut the vein, 26 feet wide where intersected and appearing to be all mill dirt, with some streaks of shipping values. He states that a mill and tram will probably be built this summer.

SAN MIGUEL COUNTY.

The Smuggler-Union M. Co. has rebuilt the upper terminal of the lower tramway, tunnel houses and blacksmith shop at the mouth of the Bullion tunnel, which was destroyed by fire in November of last year. At the mouth of the tunnel an arch is built of stone, on which steel doors are hung, and in the tunnel at a distance of 40 feet another set of doors are provided. Between these two sets of doors is a 24-inch ventilator. The blacksmith and machine shops are separate buildings and constructed of stone. The mine is again running at full capacity; 450 tons of ore are daily sent to the mills at Pandora and 350 men are at work in the mines.

SUMMIT COUNTY.

The Little Mountain mill, at Breckenridge, owned by the Germania M. Co., has been leased by the Puzzle M. & Red. Co., which proposes to put on new concentrating machinery to treat the Puzzle mine ores. J. Callbreath is manager.

The Connors Bonanza M. & Red. Co. of Milwaukee, Wis., operating on Elk mountain, near Kokomo, is driving a tunnel 7x8 feet in the clear, double track, with power house, boarding houses, etc. The tunnel is now in 740 feet and advancing 6 feet per day. The company owns about 160 acres, including the Robinson dike, Smuggler, Tom Moore and other producers. J. T. Keegan is manager and W. P. Noble assistant manager.

TELLER COUNTY.

The following are the figures given out by the mills and smelters for the January production of Cripple Creek district:

	Tons.	Average Value.	Total Value.
Colorado-Phila. at Colorado City...	10,500	$22 00	$231,000
Standard, Colorado City.....	13,500	26.00	351,000
Unlon, Florence...	3,500	25.00	212,500
R. M. Smelter, Florence.....	500	60.00	30,000
Dorcas, Florence..	2,700	27.50	74,250
Economic, Victor.	4,100	50.00	205,000
American S. & R. Co.....	15,500	60.00	930,000
Total	50,300		$2,033,750

The number of applications for leases on Cripple Creek mines in every section of the district is said to be increasing. It is noticeable that the royalty percentage exacted is generally lower than ever before.

It is reported that the Elkton Co., at Cripple Creek, will use a diamond drill for the purpose of exploring the ground lying south of the shaft at the 800-foot level. The flow of water, at one time the heaviest in the camp, has decreased so that one station pump in the 800-foot level handles it without strain.

It is reported that W. S. Stratton of Cripple Creek contemplates the erection of a cyanide plant of great proportions, possibly capable of handling 600 tons of ore a day.

The annual report of the Anaconda M. Co. at Cripple Creek shows that during the year the royalties paid by lessees amounted to $60,399.10.

The Mary McKinney Co., at Cripple Creek, G. Keener manager, has resumed sinking in its three-compartment shaft. The shaft is 4x16 feet in the clear and has a present depth of 500 feet; it is to be put down to 600 feet.

IDAHO.

BLAINE COUNTY.

The Intermountain M. & M. Co., which has a bond on the Wolftone group of mines, near Hailey, has let a contract for 250 feet of tunnel No. 2. The tunnel No. 1 just completed exposes a vein 20 feet thick.

IDAHO COUNTY.

Reports say that there is but 2 feet of snow on the ground at Thunder mountain, and a stage line which is being constructed from Ketcham has been completed to a station within 30 miles of Thunder mountain. The mill on the Dewey group is reported as running steadily, with the first cleanup of gold from the plates sustaining the claims of pay values that have been made.

F. Brown, manager of the Jumbo mining property at Buffalo Hump, says the Jumbo property has now been steadily operated for over two years. A 4-stamp mill and a Wilfley concentrator were put in operation last August. The property has produced since that time $5000 per month in gold, taken from the plates and in concentrates. They are enabled to save about 75% of the gold in the milling process. All of this ore has been taken from a pay shoot from 6 to 12 feet in width without sorting. They expect to put in a new 20-stamp mill in the spring and will also erect a large concentrating plant to treat the tailings.

KOOTENAI COUNTY.

The Richmond G. M. & M. Co. has been incorporated at Tyson to work the Richmond, Washington, Idaho, Morning Star and Gold Bug fractional lode claims at Tyson. The Richmond ledge is in a fissure 14 inches wide, cutting a porphyry dike. A force of six men has been put to work, all agreeing to accept one-half stock in payment of wages. The new company's officers are H. W. Desgranges president and P. Desgranges secretary and treasurer.

OWYHEE COUNTY.

A. F. Stevens has made the surveys of the ground for the site and plans for the mill at Silver City to be built by the Addie M. Co. Construction will be begun as soon as the contracts are made. The mill will be ten stamps and be run by electric power, only five stamps being put in to begin with.

MONTANA.

CASCADE COUNTY.

D. Llewellyn and W. H. Harmon, who are leasing on the O'Brien property at Neihart, are reported to have taken out thirteen tons of what is almost malleable silver. The ore, it is said, runs 18,000 ounces silver to the ton.

FERGUS COUNTY.

The North Moccasin G. M. Co. has been incorporated, capital $2,500,000, by J. D. Waite, F. E. Wright, W. C. Waldorf, W. C. Draper, A. H. S. Bird of Salt Lake City, Utah, A. S. Wright and A. W. Warr, the latter being secretary of the company. The Waldorf, Draper and Riser properties at North Moccasin have been bought by the company. Development work is being done and it is expected to build a mill in the spring.

The automatic tramway between the mine and mill at the New Year G. M. Co.'s property at New Year has been completed. The cost of the erection of this aerial tramway is $17,500 and the total weight of the cables and castings used in its construction is over 86,000 pounds. The tramway was erected under the supervision of C. A. Case and is suspended from eighteen towers, varying in height from 14 to 56 feet. The tramway is run on two cables, known as the track and grip cables, which rest on arms reaching from the tops of the towers, and the ore is carried in forty-five buckets which hold about 600 pounds of ore each. The tramway is self-operating, the loading station at the mine having an elevation of 602 feet above the mill terminal.

FLATHEAD COUNTY.

From West Fisher it is reported that a building boom is setting in in the town of Cabinet. W. J. Beager, manager of the American Kootenai M. Co., is preparing to install an electric compressor plant and air drills, after which the mine will resume operations.

The Northern Montana M. Co. officers at Kalispell are considering the doubling of their force at the mine. The main tunnel is now in 100 feet.

PARK COUNTY.

W. L. Tipton, secretary of the Climax G. M. Co., of Spokane, Wash., has taken a bond and option upon the McCauley mining properties in the Crevasse district, near Livingston. He has started work upon the mines and states that he expects to start the mill up. H. Bush is manager.

GALLATIN COUNTY.

The Montana Corundum Co. has bought machinery for the corundum mines on Camp creek, near Bozeman. It has been determined that the corundum vein grows larger with depth, and the area of the deposit has been found much larger than at first supposed.

LEWIS AND CLARKE COUNTY.

The Exploration & Mining Co., capital $1,000,000, has been incorporated at Helena to develop some of the abandoned mines and good prospects near Helena. The directors are N. B. Holter, N. J. Gould, C. W. Whitley, A. H. Barret, G. E. Gunn, S. T. Hauser, T. C. Kurtz, C. C. Newman, E. C. Babcock, S. Wheaton, H. Sieben and B. H. Tatem. It is reported that the Scratch Gravel district mines will be reopened and that the Kenwood property will be worked.

TETON COUNTY.

The Chief Mountain M. Co. has been incorporated, capital $30,000, with J. H. Van Pelt president and W. J. Barrette secretary and treasurer. The company owns the group Two For, Sunday, Chief and Abbie Belle claims; office at Salt Lake City, Utah.

NEVADA.

ELKO COUNTY.

The Smuggler mines, in Good Hope district, have been sold to C. W. Jordan and D. S. Dunbar, of Omaha, Neb.

NYE COUNTY.

R. W. Calderhead, of Dawson, proposes to put on traction engines for hauling freight between Tonopah and the railroad at Sodaville. Two tractions, each capable of drawing seventy-five tons of ore, he states, will be put on, and he expects they will make an average speed of 3 miles an hour. Three men will be required on each.

It is reported that a rich strike had been made 10 miles north of Tonopah and that a rush to the new find had taken place.

The Ohio Tonopah Co. has been incorporated under Arizona laws, with office in Youngstown, Ohio, to take over and develop the California, Colorado, Arizona and Utah claims at Tonopah, held by B. E. Shear, S. A. Knapp and E. E. Knapp. The present shaft will be enlarged to a double-compartment, which will be sunk through surface porphyry and the ledges opened by crosscuts.

The Tonopah Bonanza M. Co. is a new incorporation of Tonopah mines. H. Gates is president and A. G. Gurnett of San Francisco, Cal., is secretary. A shaft is being sunk on the property.

WASHOE COUNTY.

The Cabin No. 2 mine, at Olinghouse, formerly owned by Francovich, Del Piazzi and Dondero, has been sold for $80,000 to San Francisco people, through M. D. Young and C. J. Dickers. The mine shows high-grade ore from the surface to a depth of 210 feet. It is proposed, if enough other mining ground and ore can be secured, to erect a large stamp mill on the river and work by water power.

NEW MEXICO.

COLFAX COUNTY.

The Denver mine, at Elizabethtown, M. Walsh manager, is installing a large cyanide plant, a new steam hoist for the shaft on the Denver and other machinery. The mill on the property is under construction. The gasoline engine now on the Denver shaft is to be removed to the Arlington tunnel, another property of the Ohio G. M. & M. Co.

GRANT COUNTY.

The Lena M. & M. Co. is building a railroad from its properties in the Virginia district to Lordsburg, at which point it is erecting large concentrating works. The road will be 4 miles long.

At the Arizona mine, at Pinos Altos, the main shaft is down 104 feet below the second level. Smelter returns from the ore give 4.05 ounces gold, 17.7 ounces silver and 3.80% copper—a value of $82.30 to the ton. Twenty men are employed.

LINCOLN COUNTY.

The Free Gold M. Co. has been incorporated, capital $500,000, to engage in mining near Nogal. The company owns the Enterprise, Corker, Cracker Jack, Gold Bar, Ruby, O. K., Nannie Baird, Mollie Gibson and Side Issue claims, and will do development work until ore in sight warrants the building of a reduction plant. The ores are all free-milling.

OREGON.

GRANT COUNTY.

The Prairie Diggings mine, near Prairie City, owned by the Hoosier Boy M. Co.,

E. J. Foster, manager, is reported to have opened up a large vein of ore by tunnels and an open cut. The getting out of this ore is a quarry proposition on a large scale. A 20-stamp mill has just been completed and the mine put in operation. The new stamps weigh 1000 pounds each, and the mill is run by water power. The company owns a water power for a 100-stamp mill, and it proposes to increase the number of stamps until the water power is utilized.

JOSEPHINE COUNTY.

A meeting of mining men, among whom was C. R. Johnson of Montana, has been held at Merlin, 8 miles north of Grant's Pass, to consider the erection of a smelter at Merlin, which is centrally located in the northern Josephine mineral region. Another meeting to further consider this question will be held and a permanent organization is talked of.

UTAH.

BEAVER COUNTY.

The Monte Cristo G. & C. M. Co. has been incorporated at Salt Lake City, capital $125,000. J. L. Craig is president and J. H. Featherstone secretary and treasurer. The company owns a lease and bond on the John Kemple and Good Luck claims in the Star district.

JUAB COUNTY.

About one-third of the earned dividends of Tintic mines are not made public because of private ownership. Following is the published list for 1901:

Cen. Eureka	$200,000
Carisa	30,000
Mammoth	100,000
May Day	18,000
South Swansea	7,500
Swansea	29,000
Uncle Sam Consolidated	45,000

PIUTE COUNTY.

The Golden Ridge M. Co. of Marysvale has been incorporated, capital $20,000, with M. R. Dalton president and M. F. Murray secretary. The company owns the Hattie, Promise, Jewel, Elgin, Midland, Rock Springs, Marysvale, Neuta, Fawn and Hill Contact claims in Mount Baldy district.

It is reported that Manager Rader of the Annie Laurie mine at Gold mountain has recommended to the company that it add immediately to the milling plant, proposing that the capacity of the present plant be doubled to provide facilities for treating 400 tons daily.

SALT LAKE COUNTY.

The Brekly G. & S. M. Co. has been incorporated at Salt Lake City, capital $5000. G. Romney is president and C. B. Stewart secretary and treasurer. The company owns the Mineral King, Mineral King Nos. 1, 2, 3 and 4, Red Pine and Red Pine Nos. 1, 2, 3, 4 and 5, Copper King, Copper King Nos. 1 and 2, in Little Cottonwood district.

FOREIGN.

BRITISH COLUMBIA.

Finch & Camphell of Spokane, Wash., have received the first consignment of gold from the Second Relief mine, near Ymir, on which they have installed a 10-stamp mill, which in its first month's run has returned $2000 gold. The present stamp mill is a link in a system of more extensive surface improvements which will probably be employed. It is stated as probable that a cyanide plant will be installed to treat the tailings.

The annual report of the Le Roi No. 2 mine states that the company has 240,000 tons of ore in sight and a plant capable of getting out 250 tons of ore daily. During 1901 the gross expendlture in mining operations was $277,624; shipments to the smelter for the year, 24,689 tons, containing gold $226,624, or $9.18 per ton; silver, $22,739, or 92 cents per ton; copper, $186,641; total gross value, $435,005; average per ton, $17.65. The costs of mining and loading on cars were $3.58; freight and treatment, $6; reductions from gross metal values, $1.98; total cost of realization, $11.56, leaving net value per ton profit of $6.09. The purely mining costs per ton were: Stoping and loading on cars, $2.90; development, 12½ cents; machinery and plant, 15 cents; surface, 30 cents; mine equipment, 10 cents; total, $3.58. Bernard Macdonald is manager.

The lead and copper furnaces at the Canadian Smelting Works at Trail have heen hlown out and are to remain so until alterations under way are completed. The old sampler, with a maximum capacity of 1000 tons in twenty-four hours, is being replaced by a modern automatic crusher and sampler of 1500 tons capacity in ten hours. A site for the new refinery is heing prepared. The Center Star and War Eagle mines at Rossland will commence shipping on a large scale as soon as the machinery is in operation.

The contract for sinking in the main shaft of the Le Roi mine and for drifting on the 1050-foot level has been let to Vance, Skugland & Co. at their bid of $10,000. The work, it is estimated, will require three months to complete.

BRITISH GUIANA.

J. P. Skelly of the New York Syndicate, operating there, has brought out to Demerara from the upper Mazaruni 112 diamonds, three emeralds and three blue sapphires, found while prospecting with three men. Mr. Skelly reports that the claims he located—1350 acres—show good indications of being rich. In prospecting, as many as twenty-eight diamonds were found in one prospect hole near a small creek. He also reports that there is a hill of fair size showing indications all over.

The British Guiana Syndicate are going ahead with construction work and will soon be started. The Marshall Syndicate are doing a good deal of prospecting and are making a hridge to convey their stuff to the creek. The Menzies Stripp and Morris Syndicate are taking out up to 300 diamonds a day on one of their claims.

CHILE.

It is stated that 588 cars of sulphide ores have been shipped from Chile, South America, to the smelters at Puehlo, Colo. The transfer from ocean vessels to the railroad was made at Galveston, Texas.

INDO-CHINA.

M. Marc Bel, a mining engineer of Paris, France, who has recently traveled over a large part of Indo-China for certaln mining companies, says of the mineral wealth of the country, that the geological formations, by their nature and disposition, are such as should contain minerals in abundance, while the economical conditions are very favorable to the development of the mining industry. Apart altogether from inferences from the nature of the rocks, it is known that sapphires, gold, tin, copper, zinc, antimony, lead, iron, coal, marble and china clay exist, and many deposits of these are worked to some extent. Burmese prospectors found sapphires on the left bank of the Meekong in 1890, and for a time worked the heds with success; auriferous deposits, especially placers, are numerous, and they have been worked hy the natives from time immemorial. Several mining companies are at work at these deposits, hut the production is still very small. Tin is worked to a very small extent, and lead, copper and antimony not at all.

KLONDIKE.

A. Bronson and J. F. Miller have arrived at Haines Mission, Alaska, with $10,000, they claim as two weeks work on Mush creek. They would not give the exact location of their find.

The Munger quartz mill, situated on the banks of the Klondike river, is a stamp, steam-hammer mill. The machinery is inclosed and no difficulty has heen encountered from the low temperature of winter. The pulp, after running over the plates and concentrators, is discharged into a 6-inch pipe which empties into the Klondike below the level of the ice, and through a covered way whlch it is believed will prevent all stoppages from freezing.

The first quartz mining company to get its charter from the Yukon council is known as the White Channel M. Co., and its capltal stock is $100,000. The directors are J. O. Binet, N. Palardy, T. Delarge and H. Landahl. The company is organized to develop the following quartz properties, running up Bonanza and into the divide between Eldorado and Bonanza: The Pauline, the Matilda, the Marie Jane, Bald Eagle, the Windsor, the Tiger, the White Bear, the Detroit, the Laura, the Leon, the Black Bear, the Victor, the Henri, the Corinne.

MEXICO.

(Special Correspondence).—The Castellana mines at Ixtlan, belonging to the company of same name, A. Lonergan president, have been sold to the Castellana Con. Mines, Ltd., of London, Eng. R. J. Price of London is president, R. Donde and J. L. Requena are Mexican directors and the general manager is J. F. Allan, M. E. The mines Castellana and Anexas have heen large producers, the higher grade ore being shipped to Aguascalientes smelters and the milling ore heing treated at the reduction works of Lonergan & Stanhope, who have also sold to the new company. The present machinery—three Chilian mills of thirty tons capacity per day—will be added to by the new company, who propose to erect a large plant on the property. The town of Ixtlan is 30 miles from the San Marcos station of the Mexican Central Railway.

The mines at Acuitapilco are in a limestone uplift and opened from the ravines which are eroded in it. They are contained within an area of 4 square miles. The mines are divided into three groups—the Valenciana, Trinidad & Buenavista and El Mezquite. The Valenciana group comprises the Valenciana and Santa Rosalia, producing silver and gold. The output during the last two years was $40,000, from exploratory work done on a very small scale. The Trinidad group includes the Trinidad, Buenavista and San Jose mines. The Mezquite group is composed of the Mezquite, Catarina and Todos Santos.

El Zopilote M. Co., near Tepic, during 1900 made an output of $201,304.68 from 4943 metric tons of ore and from it paid dividends amounting to $63,600. The property of the company consists of the mines known as Zopilote, Frazada-Jabalina and Restauradora. The machinery consists of a 30-stamp mill, one German mill and lixiviation plant. Sulphide ores are shipped to Hamhurg, Germany.

F. Cornado is developing the group of Animas-Plomosas mines at Acaponeta, Tepic, and is making permanent improvements.

The Huicicila mining property at Compostela, Tepic, known as San Francisco-La Trlnidad, is being worked on a small scale by A. R. Partridge, who has installed a small matte smelter.

Tepic, Jan. 25.

Personal.

A J. FROEHLICH of Tonopah, Nev., is ln Chicago, Ill.

W. C. RALSTON of Robinson's, Cal., is in San Francisco.

P. MIXSELL of Denver, Colo., is sojourning in New York.

J. H. HENLEY, Supt. of the Ibex M. Co., at Leadville, Colo., has resigned.

JOHN S. BRANSFORD has been elected president Mining Exchange, Salt Lake Clty, Utah.

C. K. MCCORNICK, of Salt Lake City, Utah, has gone to Paris, France, on a short visit.

WILLIAM FLOYD will superlntend development work on Canada Hill, Nevada county, Cal.

A. M. JOHNSON has been appointed manager of the Ophir mine and mill at Stateline, Utah.

W. M. WILEY succeeds Carl Henrich as general manager Unlon Copper mine, Gold Hill, N. C.

J. E. WARDMAN is now superlntending the operations of the Traders G. M. Co. at Dewey, Idaho.

T. M. HAMMOND, civil and mining engineer, late of Republic, Wash., has located at Reno, Nev.

J. B. KEATING has been appolnted Supt. of the Bully Hill smelter at Delamar, Shasta Co, Cal.

PHILIP ARGALL has returned to Denver, Colo., from examination of the Dolores mine, Chihuahua, Mexico.

W. R. RUSSELL is now general foreman at the McClure mines at Bully Hill, Shasta county, Cal., and E. J. McLaggen shift hoss.

J. R. FLAGG has accepted the superintendency of the Maple Creek mines in Junction City, Cal., succeeding C. Scranton, resigned.

J. C. CAMPBELL has returned from San Francisco to Banner Ridge, Nevada county, Cal., where he undertakes extensive development work.

M. WALSH, manager of the Ohio G. M. & M. Co., at Elizabethtown, New Mexico, has returned to that place from an extended sojourn in Denver, Colo.

R. N. DICKMAN, of Dickman, Mackenzie & Potter of Chicago, has gone to Europe, where he will examine mines in the interest of American capital.

H. A. COHEN, manager of the Mercur mine, at Mercur, Utah, has resigned, and it is reported ls to be succeeded by John Dern, the present assistant manager.

J. C. FARRISH AND W. A. FARRISH, of Denver, Colo., have been making an extended examination of mining property in the Altar district of Sonora, Mexico.

W. DENBY has resigned the superintendency of the Ehner mines at Juneau, Alaska, and has accepted the same position with the Snettisham G. M. Co., at Snettisham, Alaska.

GRANT SNYDER, superintendent of the Dixie mines and smelter at St. George, Utah, is at New Haven, Conn., attending the annual meeting of the Utah & Eastern Co., owning the mines.

E. R. ABADIE has accepted the superintendency of the Champion mine, at Nevada City, Cal., and is expected at the mine about the middle of February, when he will immediately enter upon his duties.

C. W. BUTLER, formerly head of sampling department Puget Sound Reduction Co., Everett, Wash., is with the Pacific Coast Ore Sampllng Works, whose new building has heen completed at Adams' wharf, Oakland, Cal.

WILLIAM C. POTTER, chief mining engineer of the Atchison, Topeka & Santa Fe railway, has formed partnership with Dickman & Mackenzie of Chicago, the firm hereafter heing Dickman, Mackenzie & Potter, mining engineers.

JESSE J. MACDONALD, formerly with the Gold & Silver Extraction Co. of America, Ltd., has accepted a position with the Inca Mining Co, at Santa Domingo, near Tiraphola, Peru, S. A., and leaves San Francisco, Cal., on the 10th inst., to remain two years.

F. W. BLACKFORD of Butte, Mont., is chief engineer of the new mining project for operating the Cerro del Pasco mines ln Peru. He will be associated with J. MacFarlane, the company's resident manager, and John Chisholm of Denver, Colo., who, with Mr. Blackford, has started from New York to Callao, Peru.

WYNN MEREDITH AND C. L. COREY, of the engineering firm of Benjamin, Hunt, Meredith & Corey, have returned to San Francisco, Cal., from an extended reconnoissance in the vicinity of Prescott, Arizona, where is projected an electrical plant on Fossil creek to furnish light and power throughout that mining section.

W. L. AUSTIN, of Denver, Colo., left there this week on an extended itlnerary, and, llke all other mining engineers, wants the MINING AND SCIENTIFIC PRESS every week as usual. It may be interesting to note that this issue aud the issue of the 15th inst. goes to him at the Grand Continental, Cairo, Egypt, the issues of the 22nd inst. to Jerusalem, Palestine, those of the 1st, 8th and 15th prox. to Constantinople, Turkey, and so on, round the world.

Commercial Paragraphs.

MONTEVIDEO, URUGUAY, S. A., is to hold an exposition of goods manufactured exclusively in the United States. It will be called "The First North American Exhibition on the River Plate."

THE Risdon Iron Works of San Francisco, Cal., are sending two hydraulic elevators with capacity each of 75 cubic yards per hour, and two 6-inch giants, to the Siberian Exploration Co. by a circuitous route. They go to New York, thence to Copenhagen, to Libau, to Tomsk, Siberia, and the Achinsk district, 300 miles southeast of the last named place.

THE Pyne Smelting Works at West Alameda, Cal., has put in two new furnaces, dally capacity of each forty tons. Smoke and vapor are conducted through a condensing chamher and subjected to a water spray to deposit and save such values as may escape through the flues. Water and rail shipping facilities are at hand. Appliances for handling are expeditiously and economically being used. E. W. Pyne, whose smelting experience covers many years in different parts of the world, has direct charge of the works. The company says it is prepared to handle gold, silver, lead and copper ores of all grades.

WM. JESSOP & SONS, LTD., of Sheffield, England, have introduced an entirely new type of quick speed, self-hardening steel, for which are claimed: Uniformity and easy manipulation, with the best working results in shop practice. Instructions for working are simple and no elaborate process of hardening is required. The tool to be forged is heated uniformly to a bright red, forged to shape and allowed to cool. They say: "To harden, place the nose of the tool in the fire, and heat to a good white heat. Allow to cool away from the hearth, and thoroughly remove, by grinding, the thick scale which results from this high temperature. After the tool has heen ground four or five times, to get the best possible results it is found advisahle to reharden, without, however, dressing the tool in any way." Jessop's American headquarters are at 91 John street, New York.

Obituary.

CAPTAIN THOMAS COUCH died in San Francisco, Cal., on Feb. 6th, at the age of 58 years. The deceased was one of the best known mining men on the Pacific coast, having at various times heen connected with the operation of the mines on the Mariposa Grant in California and the great copper mines at Butte, Mont. Lately he had been largely interested ln the successful gold dredging enterprise at Oroville, Cal.

Recently Declared Mining Dividends.

Bunker Hill & Sullivan M. & Con. Co., Idaho, monthly, $21,000	Feb. 4
Carihoo G. M. Co., British Columbia, 1½ cent per share	Mar. 1
Yankee Con. M. Co., Utah, 5 cents per share, $25,000	Mar. 1

MINING AND SCIENTIFIC PRESS.

Whole No. 2169.—VOLUME LXXXIV. Number 6. SAN FRANCISCO, SATURDAY, FEBRUARY 15, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Technical Books and Technical Journals.

The busy mine manager, mining engineers in active practice, and specialists in all of the many technical branches of mining and metallurgical industry, depend to a steadily lessening extent on technical books, and to a steadily increasing extent on current technical journals, to keep them informed of what is new and improved in the art. Mining is a many-sided art. It is at this time receiving the application of a concentration of brain energy, that is extending its limits into what on the one hand has been considered as abstract science, and what on the other hand has been considered just practical, every-day commercial business. Books, the publication of which a few years since was rapid enough to keep those engaged in the art in knowledge of what was going on in its advance, are now too slow of publication to give this service. Also, what the man wants who is making a commercial use of science is the minutest detail of its every-day, practical application by others similarly engaged. The mass of this would stagger a book writer—that is, one who tried to tell it all in books—and, it might be added, would be even more overwhelming to a book reader.

Old Dominion Mine and Smelter, Globe, Arizona—(See page 88.)

The little things in an art can not be boiled down to a paragraph or condensed within one small book; but they can be given in assimilable installments. It is the only way they can be successfully taken. Hence it is the workers depend less and less on the technical books and more and more on the technical journals. Even the mass of the latter is with difficulty fully assimilable by the busy worker. A consulting engineer of the writer's acquaintance said recently to him, pointing to a mass of weekly and monthly technical journals piled on his desk: "I do not get time to read them all through. I go through them rapidly, picking an idea here and there, not trying to remember it all, but just that I have read it and where, so that when the time of use of the idea comes I know where to look for it. Even the burden of this is, I find, too heavy for the mind unassisted, and I am scrapping the papers. You don't see the MINING AND SCIENTIFIC PRESS in the pile, because it is all cut up into scraps. These scraps are pasted in scrapbooks and card indexed for me. One set of scrapbooks has only matters relative to the cyanide process. Another is confined to stamp mills and free-milling practice. A third has placer mining and gold dredging for its subject. Others deal with hydraulic work, electrical power development, copper mining and smelting. It is not alone the long papers on these subjects that are clipped and scrapped, but the short ones as well. The latter all have point to them and bring out valuable detail that in longer articles is passed over. I do not think I could keep in touch with what other men are doing and gaining but by this selective method of using what is new and current while it is new and current. Books are all right for general principles and as the foundation for a student; but for the busy man, unless the books are the latest manufactures' trade catalogues, they are only history. What they tell he should know earlier and better from current technical journals and the latest trade catalogues and price lists. It is even a question if the student could not with much advantage leaven his book knowledge by using with it the masters' tools he must in the end do his work with."

It was rather a long talk for a consulting engineer, but it expresses the up-to-date practical action of the men who are making the history of the modern art of engineering. It is this instinctive tendency among the doers that brings requests to the publishers of this journal to have it forwarded to them direct by the shortest time route wherever they may be temporarily placed by their occupation. The intention to keep up with the procession of their fellows by knowing quickly what they are from week to week doing is giving to the technical journal a wider and more permanent field of usefulness than that given to the books of the art.

The book still has a place, it is true, but it is a different place and a relatively less important place. It is realized now that what may be termed the adaptive knowledge of an art is ever changing. Nowhere is this more obvious than in mining. In the current writing-up of newly constructed mining plants they are always referred to as "modern" to emphasize the contrast with plants constructed five years ago—or it may be only last year—which by suggestion are thus made "ancient." The books get the descriptions and methods of the five-year-old plants all right, but must miss the newer ones. It is a fortunate book that, five years old, does not record some details of operative practice in metallurgy that have been replaced later by improvements. Books, though, will always serve the student in the art. They short-cut through the vast mass of a more or less perfect record of practice in which the immature mind of a student can not be surely selective. Besides, the student wants a firm foundation of the basic principles of the art in order not to lose the sense of proportion between cause and effect. This sense of proportion and the logic of cause and effect once secured, the trained mind of the engineer can and does leave its anchor in the books to use the wings that the current records of the technical journals offer it.

Gleeson Camp, Cochise Co., Arizona—(See page 88.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 4 50

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

☞ MR. GEO. S. SCOTT is now our Chicago representative, office 737 Monadnock Bldg., Chicago, Ill., and is authorized to transact business on behalf of the MINING AND SCIENTIFIC PRESS.

San Francisco, February 15, 1902.

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Some Lead Mining Conditions.

There are some signs that the lead miners of the United States have seen the worst of the low sale price condition. The settling price has been advanced 10 cents a hundred pounds by the American Smelting & Refining Co., which would indicate that there has been a shrinkage of current production below current consumption sufficient to begin the gradual clearing away of the surplus lead in stock. The effect of the slight advance in stimulating production can not be known yet, but if it should bring any large increase the price will undoubtedly drop back to the amount of advance at least.

British Columbia lead miners continue to find the business unprofitable. They are making close investigations of the several items of cost charges and acquiring in adversity a knowledge of the real conditions under which they have been operating. It would seem—confirming what this journal has stated—to be the mine owner who has, from one or more natural favoring conditions, the more desirable mine who has the greater cause for complaint, rather than the mine owner who has the less desirable mine.

Specifically, it is claimed that mines favorably situated for transportation are charged a smelting and transportation rate in excess of that charged ore from mines less favorably situated, so that the profit margin of the advantage is appropriated by the smelting and transportation interests. This is certainly an unfair discrimination which, so far as the transportation interest takes part in it, is simply "highway robbery" under the cloak of business. The fact that the transportation interests assume they can not exist except by this method of business does not make its real character any different. The claim may be true that it is done to make the good mines divide and partly carry the cost burden of the poor mines, but in the end it does not do it. The added production of the assisted mines becomes the surplus production which breaks down the sale prices and wipes out a profit which the good mines would have had and which their owners are justly entitled to. Naturally, owners of mines who find, after they are in them with their capital investment, that their mines are at natural disadvantages which make them, relatively speaking, poor mines, do not object to an equalization which makes, or claims to make, owners of, relatively speaking, good mines, share their disadvantages. They get something that they otherwise would not have at all.

The owners of the relatively good mines are the people who are hurt by this condition. Why such conditions should be permitted to exist indefinitely with British Columbia lead mining is not clear. The Government subsidizes and has a control over transportation, and it proposes to subsidize a refinery for lead. There is with these two elements the power to make such discriminating charges for the refining of lead that the natural conditions between mines as to profit-earning power shall be restored.

Mine Taxation.

The taxation of mines is at this time of year a matter of interest to the owners. The assessor either is already, or will soon be, in evidence establishing valuations that may prove to be the basis of reasonable equitable taxation, or that may prove to be a basis for the imposition of fines on thrift and industry. In the purely mining counties of most of the States the assessor's work does not often result in establishing either unreasonable or inequitable valuations. In counties where mining is subordinate the reverse is quite frequently the case. It is but fair to state that the laws defining what is property to be taxed are at the bottom of the difficulty with the question in some States. Under the definitions, what is commercially and technically considered by miners as "dead work," is considered by the assessors and outside public as being real property. Dead work in a mine is construction that in no case is directly productive. It is construction the investment in which is a "waste" technically considered. This "dead work" investment is never recoverable from the "dead work." Dead work is not a chattel or a thing that can be sold by itself. Yet by some queer perversion of intelligence lawmakers and assessors make this "wasted" investment the basis of mine valuations. The mine which has the more "dead work" about it, if going, is given a higher assessment valuation than the one with the lesser investment in "dead work." The method of establishing an assessment valuation for a mine precisely as its commercial value is established seems to be entirely overlooked.

The mine owner when he sells a mine finds that the buyer determines what its market value is by first measuring and estimating the ore bodies in sight and then deducting the cost of recovery of their values plus a reasonable mining proposition profit. The valuation so made is the market valuation. The assessment valuation should be measured from it exactly as the value of other taxable property is measured. It is obvious that only real existing property in mines would be assessed and taxed, were the commercial rule of valuation applied to determine the assessment valuation. Locations and prospects would not be taxed. Tunnels would not be taxed. Mines that are earning nothing would not be taxed. A miner's hopes and his luck chances would not be assessed and taxed. What would be taxed would be the ultimate net profit values of the ore in sight. This would be reasonable and relieve the whole subject of mine taxation of the befogging theories and pocket irritation which it now causes. On the whole, it is a question if the adaptation of this rational rule of assessment would require legislative action to establish it. It is so thoroughly defensible in a court of equity that it might stand the analysis of a law court. Of course, it will be said at once that a mine assessor would have to be a mine expert. It is true, but why should he not be? The end sought being proper and desirable to secure, it would certainly justify a community in making a mine expert its assessor, even though the thought of it is novel.

The present various rules of assessment for taxation cannot be considered wholly satisfactory to any one affected, excepting only the Montana rule, which imposes a fixed rate of tax on net earnings. Practically it amounts to very nearly the same taxation charge as would result from the operation of the rule suggested above. It is a little better for the miner in that he pays nothing till he gets it out of the mine and turns it into money. It has also the advantage of eliminating the uncertainties incident to the estimation by mining engineers of ore in sight. On the other hand, the percentage taken in Montana is higher than the average rate of taxation of other property, and it is paid on full cash value, not on 40% or so of it.

RAILROAD CONSTRUCTION IN ALASKA, considering the undeveloped and practically unknown character of the country and its possibilities in dormant resources, is receiving an amount of serious consideration that could hardly have been foreseen even three years ago. There is no reason to believe that it is not justified by the conditions there and here. The country has no population to speak of at present, but the climatic severity of the high northern latitudes is no longer a bar to economical industrial work. People live and work there much as they do anywhere else. The sure known resources can be utilized so cheaply that there is a large margin to cover the large cost of building and operation of railroads to make them available on even, or better than even, terms with the same production elsewhere. Leaving possible agricultural resources out of consideration, timber, coal, iron, copper and gold by themselves justify large aggregate investments in many comparatively short lines of railroad which will open them up to a connection with harbors on the open sea. Waters powers are abundant and can be cheaply utilized. The minerals (for which in other and longer exploited districts deep mining is necessary) in Alaska are at the surface, where for a considerable aggregate of production only cheap quarry methods are necessary. The future has not been discounted out of Alaska resources, and for themselves they justify railroad constructions which under other conditions would not be under consideration till they could follow established industries and population.

COLORADO AND WYOMING PETROLEUM DEPOSITS are beginning to yield results that indicate that very large commercial values can soon be exploited from them. The development has the desirable feature of not affecting adversely the commercial value of already exploited petroleum fields in other localities. Petroleum is so bulky a commodity, when its commercial value and the cost of its land transportation are considered, that the new production of these Rocky mountain fields does not, to establish itself as a local business, have to displace an established business in other petroleum fields. The discoveries have been made at the right time to provide a cheap fuel to meet a demand for cheap power that has absorbed close on to the limit of possible water power development, and for which coal is too costly. With the exploitation of every new-found mineral deposit, and particularly petroleum, some failures of exploration works are inevitable, but what may be distinguished from such failures as mistakes or errors should be largely possible of avoidance. Experience with California and Texas petroleum development is quite recent enough to be a guide as to what to avoid. Colorado and Wyoming petroleum should be successfully developed without the enormous waste of money that has characterized the petroleum development of the other States.

THE installation of telephones and lines to connect separated portions of mining plants, and to connect them with towns which are the base of operation and supply, is not attended with any great cost. The service rendered by the telephone connections would justify a very considerable cost of installation. No mistake is made in installing a telephone plant right at the beginning of a prospecting or development operation on a mine. As illustrative of the low cost of the plant in one instance reported, two telephones, dry batteries, 2 miles of wire, insulators and a few tools cost $45; and the installation, using trees for poles, cost $15, making the total cost $60. Two of the miners put the line up, including the clearing out of tree branches, in two and one-half days. In another instance, three instruments and 5 miles of line were put up on poles at a cost of $140. The poles used were 4-inch scantlings 16 feet long.

THE rain and snow fall of the last two weeks has cleared away any uncertainty as to the supply of water for this year's dry-season mining in California. While at the beginning of it the depth of snow on the summits was only 2 or 3 feet, it is now several times that and about the quantity at this writing of the average California winter. Generally, reservoirs are insured of being filled, and the high-water stage of the mountain streams will probably extend well into the summer. Mining operations this summer will certainly have the use of an average season's water supply.

Concentrates.

THERE is no duty on zinc dust.

ASPHALTUM is the final residue of rofined California petroleum, representing from 20% to 40% of the oil.

FROZEN DYNAMITE has been knowr to explode. No needless chances should be takon in the handling of it.

THREE GALLONS OF WATER per minute will run through 1200 feet of ¾-inch horizontal pipe under 50 feet hoad.

PLATINUM is used instead of iron or steel for the connection on a circuit breaker of an induction coil, because it neither melts nòr oxidizes.

IN furnishing olectrical power for a gold dredger, 75 H. P. may safely be reckoned for a 5-foot dredger, and 47 H. P. for a 3-foot dredgor.

DISSOLVE 3 pounds salt and 1½ pound sal ammoniac in a gallon of water, and the mixture will be as good as that in hand grenades for fire extinguishing purposes.

AT $43 per share, the value of the Anaconda property would be $51,600,000. It has gone as high as $130 per sharo and was recently quoted at about half that figure.

ABOUT 2000 gallons per ton of ore milled, or 6¾ gallons per stamp per minute, would be a reasonable estimate of the water required for a stamp mill, including all operations.

THE right of an alien to inherit a mining claim located on Government land, as against every person but the United States, is determined by the laws of the State in which the claim is located.

THE Roentgen rays furnish an easy and infallible test for the genuineness of a diamond. The diamond being composed of pure carbon, alone among gems, is perfectly transparent to the x-ray.

H. W. MEADER, now a miner at Chewelah, Wash., is believed to be "the first California copper miner," having erected a blast furnace for the smelting of copper ore in Calaveras Co., Cal., in 1865.

PLENTY CELESTITE—strontium sulphate—is procurable in California, but it is in extensive commercial use only in England and Germany, and the freight would make the price realized from it unprofitable.

A LONG-TIME EXPOSURE will, with natural sunlight that is deficient in quantity for ordinary photographing, give a better photograph than can be obtained by short cutting the time by using a flashlight exposure.

HYDRAULIC PIPE of large size has been made in a field shòp in lengths of 72 feet where the line in which it was subsequently to be laid was accessible for hauling to it, using skids. No deforming or injury to the pipes resulted.

IF there is any considerable quantity of aluminum minerals present in lead ores the custom smelters may add the percentage to the silica percentage and penalize it the same as if it was silica. It is considered a more troublesome ingredient than silica.

THE blower used in bessemerizing copper matte requires a pressure in the upright converter of from 12 to 15 pounds: in the trough or barrel converter from 3 to 10 pounds. In the use of a direct-pressure blower, the two vanes of the blower revolve in a shell.

UNDER favorable circumstances placer ground might be worked with a gold dredger at an average cost of 3½ cents to the cubic yard, which works out about a grain of gold to the ton; but, ordinarily, it will cost nearer 5 cents a yard to operate a gold dredger.

ALUMINUM in nature occurs in compounds nearly all of which have much higher melting points than the metal itself or than other metals. The temperature of fusion is reduced by fluxes which combine with the aluminum minerals at temperatures below the fusion of the latter.

A LEDGE discovered in a county road can be located unless the county has a fee title by mesne conveyances from a patent. If the county has title by patent other than for a quartz mine the county title extends on the dip of the ledge only to the vertical plane of the boundary of the road tract.

THERE is no restriction in the United States mining laws on the number of claims one man can locate in a district or State. Miners by local laws can make limits on the number of claims one man can locate in a mining district. It does not matter whether the locations are of lodes or placers.

TAPPING and draining old mine workings into a tunnel is possible without much exposure to danger if the old works have been surveyed and a record kept. It is then practicable to survey a connection and make it with a drill hole, draining it in advance of completing the connection hy a drift.

THE softest copper is deemed best for amalgamated plates. Copper which carries the least oxygen is the softest. If a plain plate of copper is highly oxidized, there are innumerable points of suh-oxide of copper exposed on the surface of the plate, and mercury will not amalgamate with this oxide.

COPPER exceeding in amount the equivalent of 0 0128 gm. of the oxide to 50 c. c. of solution as the sulphate may be separated completely, even in the presence of a moderate amount of strong nitric, hy the addition of sufficient amount of oxalic acid. Copper may be separated from cadmium, arsenic, iron, and small amounts of tin, when precipitated by oxalic acid in a volume of 50 c. c., containing 5 c. c. strong nitric acid.

THE only weight measure common to the troy and avoirdupois weights is the grain. The avoirdupois pound contains 7000 grains and a ton of 2000 pounds 14,000,000 grains. The troy ounce is 480 grains, so there are 29,666⅔ troy ounces in one avoirdupois ton, and one troy ounce is .00318146 of 1% of a ton.

ONE HUNDRED years ago England produced the most copper of any country—about 7000 tons—in 1901 about 300 tons. Copper extraction began in the United States in 1845. Modern copper smelting came up during the past decade. The Rio Tinto and Tharsis mines afford the best example of wet extraction of copper.

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BIOXIDE OF SODIUM, when moistened, decomposes and gives off oxygen. The sodium, moreover, that remains after the liberation of the oxygen absorbs carbonic acid gas, so that if moistened bioxide of sodium be placed in a confined space in which an animal is breathing, it not only replenishes the supply of oxygen, but also keeps the atmosphere free from the deleterious gas emitted in the process of breathing.

DRILL POINTS can be tempered and rendered very hard by the use of the following composition: Six ounces carbonate of ammonia, six ounces nitrate of potash, four ounces soap and fifteen gallons of soft water. These ingredients should be thoroughly mixed by agitation. The tool points, while still red hot, must be submerged in the liquid only so far as the tempering is wanted, and supported in this position until cooled and hardened sufficiently.

ALUMINUM minerals in the ganguo of a lead ore raise the temperature of fusion of the slag above that of the lead and tend to make the slag less fluid. With aluminum minerals present the furnace mixture requires a larger proportion of fluxes. The ore containing it is thus less valuable to smelters in proportion to the quantity. Ordinarily the quantity is small and can be lessened by washing, so that no deduction is made by smelters for it.

OXIDIZING lead, tin or zinc produces more weight in oxide than the original metals weighed at the start, if nothing but heat is used for the purpose of making the oxides. Whatever weight of oxygen is used to convert the metal into an oxide is added to the weight of the metal when the whole is converted. Lead oxide is PbO. The combining weight of lead is 207, of oxygen 16; so 207 ounces lead will use 16 ounces oxygen, and the lead oxide will weigh 223 ounces. The combining weight of tin is 118, zinc 65.

SO FAR as "Concentrates" is advised, there is no plant in Canada where tin scrap is treated for the recovery of the tin. There is a small plant in San Francisco, Cal. The margin for pay is not large enough to admit of using any raw material but the clean, bright scrap. At most places where the scrap is made in making tin cans it could be had for the asking or at a merely nominal price. There are several processes that are practicable. The electrolytic methods seem promising of cheap commercial results.

GENERALLY SPEAKING, tailings that go $1.50 per ton are susceptible of profitable treatment by cyaniding, but careful and repeated experiments should be made on a small scale in any individual case to show the certainty of a margin of profit before going to any expense in plant. At Mercur, Utah, tailings going as low as $1 per ton have been profitably treated. The details of such treatment have been given in these columns at considerable length in special articles written for this paper by those who successfully did the work.

IN treatment of ore by the cyanide process, the size of the leaching vats is usually determined by the amount of available ore. Ordinarily, there is economy of operation in the use of large vats, both in charging and discharging, and the securing generally of better results than could he obtained by treating the same tonnage of ore spread out in a number of small tanks. The tanks may be built of any substantial substance—wood, brick, masonry, concrete or steel. Usually they are circular in shape. For nine out of ten cyanide plants wooden tanks are satisfactory, especially where the tailings are discharged hy hand. Where there are large operations and the tailings are sluiced, steel tanks with side or bottom discharge gates are in use.

"FULLER'S EARTH" is a detergent formerly much used to remove the oil and grease from woolen goods and still in use to some extent for the same purpose. Its chief present industrial use is in refining oil. Unlike true clays, it is not miscible in water and does not become a soft plaster mass. When in dry lumps, it falls to pieces in water and remains as a granular powder. It has a brown, mottled color and a soapy feel, cuts easily without grit under the knife and leaves a polished surface. It adheres but slightly to the tongue. It is easily pulverized. It contains about 25% of water, 32% of alumina and 43% of silica, but the composition varies with different specimens and the mixture can not he regarded as a definite mineral species. It is found abundantly near Bakersfield, Cal., and elsewhere in the western part of the country, though Florida is the chief source of supply in the United States.

THE weight of water required by a condenser per pound of the exhaust steam varies with the water temperature. Each pound of water absorbs nearly one heat unit for each degree F. through which its temperature is raised. The temperature of steam corresponding to a vacuum of 24 inches of mercury, or twelve pounds per square inch, is 140°, but the actual temperature in the hot well at this pressure is nearer 120°. If the condensing water is warmed to 100°, which is about all that can be expected, the heat units absorbed by each pound of water raised from 40° are 60; but if the temperature of the water at the start is 70°, each pound can only absorb 30 heat units. A condenser just large enough in winter would thus be much too small in summer. As an absolute pressure of three pounds per square inch, or a vacuum of nearly twelve pounds per square inch, one pound of steam contains 1.015 latent units of heat, which it must give up when condensed. If each pound of water used in the condenser absorbs 40 heat units, about twenty-five pounds of water must be used per pound of steam condensed.

THE influence of copper in lead smelting depends upon the sulphur present. In smelting raw ore, copper pyrites loses about one-fourth of its sulphur, and fuses down into copper subsulphide or matte, into which other copper sulphides enter unchanged. If there is not sufficient sulphur present in the charge to convert the whole of the copper into cuprous subsulphide, the residue of the copper will be reduced to metal, and alloyed with the lead, forming a hard, heavy mixture that sinks to the bottom and closes up the passage of the lead well. Even when sufficient sulphur is present, this is likely to occur in concentrating copper-lead matte, carrying 12% and upwards of copper, if the slag is highly ferruginous. The reason is that in the presence of highly ferruginous basic slags some of the sulphur is taken up by iron, and an equivalent proportion of copper goes into the lead. When running on coppery ores, therefore, slags fairly high in lime give cleaner lead, and in such cases slags with an excess of iron are to be avoided. With a slag high in lime, and, therefore, melting at a high temperature, it may be reckoned that nearly one-half the sulphur not appropriated by the copper will enter the slag or pass off as gas.

LIME in boiler feed water occurs in two compounds that are scale forming, the carbonate, which is the commoner, and the sulphate. The latter can form a very hard troublesome scale. The first thing to do toward improving boiler feed water is to find out exactly what the trouble with it is. This is done by making a chemical analysis of it. If it is found to contain carbonate of calcium alone it can be got out of the water by heating the feed water to the boiling point when it will precipitate out, and with a little time for settlement be all removed. The sulphate can be removed by heating under steam pressure to about 400° F., when it will precipitate out. This is not of very practical application with a small boiler plant at a mine. The better way may be to make a change in the source of the feed water supply even at a considerable expense for installation of a water supply plant. If this is impossible the use of aluminate of barium offers a chemical means of getting rid of the sulphate of calcium and the carbonate as well. It is soluble in water, but with the calcium salts forms insoluble compounds which settle out of it and leave the water pure. The action of boiler scale preventives used in the boiler is to keep the salts in solutions so that they do not precipitate and form a scale.

"CONCENTRATES" is not yet advised as to the exact nature of the proposed white lead process of manufacture at the projected East Kootenay, B. C., plant, as noted in last week's issue. While most white lead is still made by the old Dutch process of slow corrosion, there are several new ways, one of the best being the Bailey method, as in operation at Jersey City, N. J., where the lead is melted in a big cauldron 10 feet above the factory floor, and run into a second smaller pot over a slow fire, which keeps it at an even temperature. At the bottom of this second pot is a short, horizontal, 2½-inch nozzle, which ends in a thin steel plate, perforated with about 200 tiny holes, through which the melted lead is forced by the hydrostatic pressure of its own mass, becoming immediately solidified as it falls through the air in fine fibers of about .01 inch diameter. It cools so rapidly that one can hold his hand in the stream of fine lead filaments which cluster in festoons around it. Bunches of this fiber are forked onto trays 5 feet by 3 feet, 5 inches deep, each tray holding about seventy-five pounds, piled in stacks or tiers, through which carbon dioxide makes its way from the bottom. As the trays are filled with the lead fiber they are momentarily immersed, singly, in a tank containing an 8% solution of No. 26 acetic acid; then, after draining on an inclined platform, they are piled in stacks of twenty over openings in the floor, through which the carbon dioxide ascends, while the temperature is kept at 100° F. At the end of three days of this process of corrosion the contents of the trays are flung into water, resulting in white lead so fine that little subsequent grinding is necessary, the creamy mass passing into a cylindrical screening apparatus covered with 120-mesh wire cloth, revolving, partially submerged in water. After thorough washing the white lead is dried for the market. There is a residue of about 8% unchanged lead, finely ground, and thus suitable for the manufacture of lead acetate.

The Detection and Estimation of Small Quantities of Gold and Silver.*

By LUTHER WAGONER.

For a number of years I have, at odd times, tried to perfect a method of assay sufficiently delicate to find and estimate minute quantities of gold and silver. The object in view was to examine rocks remote from veins or mineral areas, in order to test the probability of the lateral-secretion theory. Having succeeded in measuring approximately the amount of gold and silver contained in one cubic centimeter of sea water, I present a detailed account of the method employed, with some of the results obtained.

GENERAL METHOD OF ASSAY.—The use of purified lead without other flux, blowpipe methods, extraction by cyanide, and measurement of the beads by the microscope.

The method of testing is by cupellation. On a properly prepared cupel it is easy to cupel and find a bead of 0.002 mm. diameter. Such a bead of silver weighs about $\frac{1}{21000000}$ part of a milligram. A bead 0.02 mm. in diameter weighs about $\frac{1}{21000}$ mg., and a close approximation can be made to its weight. It is desirable that the lead used in the assay should be low in silver, so as to avoid large correction; but, as the parted gold requires cupellation with lead, it is essential to have the lead used of high purity. I have found the following method to give the best results of a number tried: Dissolve 500 grams sugar of lead in 1250 c.c. of water. Place in the center of the beaker a carbon rod for anode, and near the side a 4x9-inch lead plate for cathode. Attach one cell of a dry battery and leave it a week. The difference of potential in favor of the deposition of lead is about 0.1 volt; a small amount of lead is deposited which assays much higher in silver than the sample. The battery is disconnected and the solution is allowed to stand in contact with the electrodes for two months. It is then filtered, crystallized and preserved for use. Some of the crystals are ignited in a clean, iron spoon, and the mixture of lead and oxides of lead is kept for use in the work. A portion of the calcined lead is reduced before the blowpipe on coal without flux; a part of the resulting metal is set aside as a source of pure lead and the other part is assayed. The assays showed the lead to contain $\frac{1}{21300000}$ of silver, as a mean of several trials. By fusing any of the ordinary reagents with this lead and cupelling, a notable increase of silver is found. This is especially true for all sodium salts, cyanides and ferrocyanides, and, in a lesser degree, for the mineral acids, lime, barium and borax—boracic acid being the only reagent tested that did not show an increase of silver. A sample of Mercks C. P. carb. sod. (10 molecules H_2O) showed over 3 grams Ag per ton. A sample of KC gave per metric ton 2605 milligrams of silver and 147 of gold. This was a mean of several tests, and this sample was used in the assays reported below.

MEASUREMENT.—A microscope having powers of 40 and 60 diameters has in the eyepiece a micrometer ruled on glass. With the power of 40, one division is 0.02001 mm. The latter is practically the same as a division on the ivory scale used in quantative blowpipe work. For careful work, both powers are used and a mean of the readings taken. Thus, if a head read 7.35 on the 60, it should read 5.12 on the 40. Using sunlight and reading the greatest diameter of the shadow of the head, will usually permit readings to be made to .001 mm., or one-twentieth of a scale division.

THE FORM AND WEIGHT OF BEADS.—The form of head is the resultant of three forces, namely, gravity and the surface tensions of the metal and the litharge respectively. Experience has shown that if the cupellation be done in a uniform way, the heads will show a constant mutual relation of diameter, base and height. For small heads, under 0.5 mm. in diameter, the action of gravity is much smaller than that of the other forces; hence, the heads tend to approach a spherical form, and for ordinary purposes it is sufficient to measure the diameter only, without removing from the cupel. Concerning this weight there is much confusion; thus, in Cornwall's Plattner the weight of a silver head 1 mm. in diameter (No. 50 on the ivory scale) is said to be 3.48 mg. A few pages beyond is a table giving the weight of a similar head (but measured in a jaw micrometer) at 6.12 mg. A monograph by J. M. Curtis (6th Report of the U. S. Geological Survey) gives a table for beads measured by crosshairs and a micrometer stage, and based upon perfect sphericity at zero, with a decrease of 20% for a bead 0.46 mm. in diameter, and an interpolated formula to satisfy these conditions. To test the matter, I devised a clip made of a small watch-spring, as shown in Fig. 1, which is about full size. The inside at a, b, is polished for 0.25 inch. The head is cleaned and inserted between the jaws of the clip, the base of the head resting on b, slightly nearer the top than the bottom. The clip is placed on the stage and lighted from below. It should present an appearance like Figs. 2 and 3. The polished steel reflects the image and gives a sharp line, very helpful in measuring diameter, base and height.

A number of gold beads, varying in diameter between 0.1 and 3.3 mm., were separately weighed, and also measured in the clip above described for diameter (B) of base, diameter (D) of head, and height (H) of head. In order to deduce the volume from these measurements, the height (h) of the missing segment must be known. This can not be directly measured; but an expression can be found giving the volume of the head as a fraction of the imaginary completed figure.

Fig. 1—Watch-Spring Clip for Measuring Assay Beads.

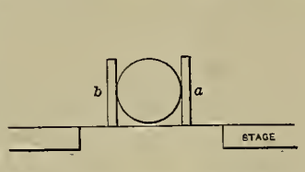

Fig. 2—Vertical Section, Showing Bead in Clip (Fig. 1).

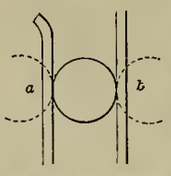

Fig. 3—Plan, Showing Bead in Clip (Fig. 1).

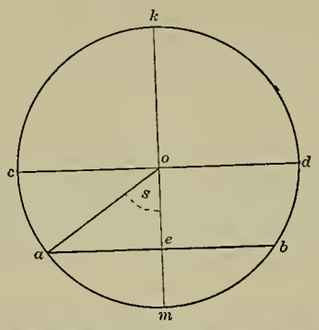

Fig. 4—Diagram Illustrating Calculation of Weight of Bead from Measurements.

In Fig. 4, ah = B; cd = D; ko + oe = H, and amh is the segment cut off. Assuming the completed figure to be a sphere, ko = om = co = od = oa = R, or radius of the sphere; and from inspection of the diagram it is clear that $\frac{ah}{cd}$ = sin. S (S being the angle aoe); and that ko + oe − H = R + cos. S.

The volume of the segment of a sphere, divided by the volume, is $3 \sin.^4 \frac{S}{2} - 2 \sin.^6 \frac{S}{2}$.

Calling this fraction P, the volume of the head ackdh can be expressed as (1 — P) vol. of sphere, on the assumption that the completed figure is a sphere. But this would never be the case theoretically and seldom practically (i. e., within the limits of practicable accuracy for the calculation here under consideration), for the obvious reason that the effect of gravity, and, possibly, of other forces, upon the liquid head must distort it from a perfectly spherical shape. In other words, km in Fig. 4 could seldom be safely assumed as equal to cd. Another factor must therefore be introduced to correct the error due to this lack of sphericity.

$$\text{In Fig. 4 } km = \frac{cd}{ke} H = \frac{2}{1 + \cos. S} H.$$

Denoting by Q the coefficient of H in this expression, we have, as the final expression for the volume of the head (1 — P) $Q \frac{\pi}{6} D^2 H$. The measurements being in millimeters, it is only necessary to multiply this volume by the specific gravity in order to obtain the weight of the head.

A number of heads weighed on a good balance 73.27 mgs. The same heads calculated by the above formula measured 72 61 mgs. One head of silver weighing 92 mgs. measured 91.463 mgs. Sin. S will not vary much if care be taken not to touch the head with the tip of the flame after it sets. In gold buttons the usual effect is to increase H and diminish D, thus giving too small a value if only D is read.

For heads too small to allow easy manipulation, the measurements are best made upon the cupel. For such work, where the scale division is 0.02001 mm., the value used is:

Weight = $D^3 \times 0.00007598$ for gold (log. = 5.8807)
and $D_3 \times 0.00004213$ for silver (log. = 5.6246).

This agrees with the value given by Curtis for silver where the diameter = 0.08 mm.

(D in the above formula is the number of scale divisions of 0.02001 mm. each)

The above constants were used in the reduction of all the tests tabulated in this paper.

FINE CUPELLATION.—Take elutriated boneash and grind it very fine in the agate mortar, heat to redness and preserve in a bottle. For the fine cupellation press in lightly ordinary boneash; heat it to expel moisture; then cover evenly with the fine ash and burnish with the smooth end of the agate pestle; heat carefully, and, before placing the head upon it, examine for cracks with a good lens. The cupel surface should be smooth and polished. The head of lead should not weigh more than 8 to 10 mg. and should be clean. As soon as fused, the head should be kept moving. When it gets too small to be seen, the stain of litharge on the cupel shows its locus. Care must be taken not to overheat near the finish. By carefully observing the above directions, 1 mg. of assayer's lead will show a small head of silver. (Suppose the lead to contain 0.1 ounce of silver per ton; then 1 mg. will give a head of 0.43 division or 0.00086 mm. diameter.

Should the assay be for silver only, the cupel is placed upon the stage of the microscope and the diameter of the button is read; or, if it is large enough to handle, it can be detached, placed in the clip, and the three dimensions measured for volume of gold and silver.

PARTING.—The diameter of the alloy is read and estimated as silver, after which it is parted as follows: Procure a supply of clear white cups or saucers of a cheap grade, which should be free from dark specks and which should stand the heat to be used without cracking or losing the assay; break into pieces about 15 mm. square and cement a piece with sealing wax to a strip of tin plate for a handle, placing the concave side uppermost. Clean the surface of the porcelain with nitric acid and wash it, leaving a drop of water on it. Place the cupel near it, and with the aid of a lens and chisel-pointed needle detach the head. With a fine splinter of wood, previously wetted, touch the head and transfer it to the drop of water. Should the head be too small for a hand lens, take a fine needle; amalgamate the point with sodium amalgam, and, having the head in focus on the stage, touch it with the point of the needle. Sufficient mercury will adhere to render the head visible, and it can then be treated like a larger head. With a capillary tube or dropper, add nitric acid very cautiously, warming the assay until the silver is seen to blacken and dissolve slowly. The gold will remain in a coherent mass. With a strip of filter paper remove the acid; add strong acid, and warm again, after which the assay is washed sweet and dried. With small amounts of gold great care must be taken to have a clean white surface to work upon, and dust must be kept away, otherwise it will be difficult to see and recognize the speck of gold.

Some of the calcined purified lead is reduced without flux on coal and can be kept in a clean box for use. Cut from it a small piece of 2 to 3 mg. weight; flatten it with the agate pestle and turn up a corner for a handle. With the forceps cover the speck of gold and gently press down the lead. Next heat the corners of the porcelain before the blowpipe, carefully working inward to the test, and fuse the latter; after which scorify the bead over the area covered by the lead when laid on, and cool. The head detatches easily and with a clean bottom. Examine the head with the lens to see that it is clean, and cupel as before directed. As gold will stand a high heat, it is advisable to measure, and, if there is any irregularity, reheat to melting point.

By observing the above directions, I have made heads which I estimated at $\frac{1}{10}$ of a scale division. The head was perfect in form and color, and, with higher powers, could easily have been measured with much precision. Such a head is calculated as follows, according to the formula, weight = $D^3 \times 0.000759$; D being 0.1 of a scale division.

Log D = 0.1	9.0000
	3
Log D^3	7.0000
Log constant, 0.000759	5.8807
Log weight	2.8807

Weight = 0.0000000759 mg. = $\frac{1}{13100000}$ mg.

It is readily seen that we have here a method at once simple and delicate for detecting the presence and estimating the amount of the precious metals.

THE PROBABLE ERROR.—As previously stated, the diameter of the head can be read to 0.001 mm. Calling this the error, and taking the weight as KD_3 (K being a coefficient) and its differential as $3KD^2$ (.001), we have as the per cent of error:

$$\frac{3KD^2 (0.001)}{W} = \frac{3KD^2 (0.001)}{KD^2} = \frac{0.003}{D}.$$

The following table shows the weight of gold heads and the probable error:

Weight, mg.	Error, per cent.	Weight, mg.	Error, per cent.
0.1	1.36	0.001	6.36
0.01	2.95	0.0001	13.69

CUPELLATION LOSS.—A sample of about 331 mgs. of assayers' sheet lead, cut into small squares, mixed and cupelled, gave a head covering 6 divisions, or 12 mm. in diameter. A sample of 41 mgs. gave a head covering 3 divisions, and one of 5.2 mgs. a bead of 1.5 divisions, thus proving that there is no sensible departure in the proportion of loss for small heads

*Trans. American Institute Mining Engineers, Mexican meeting, November, 1901.

from that of larger ones. Hence, in what follows, I have deducted the silver due to the lead cupelled and called the remainder the true amount.

CYANIDE ASSAYS.—A sample of cyanide of potassium was tested by evaporating 2 grams with 10 c.c. of water and 6 grams of calcined lead. The dried mass was fused on a clean coal and the resultant lead was weighed, cupelled and the button parted. The value found as a mean of several trials was: Silver, 2.606 grams, and gold, 0.147 grams per metric ton. A 1% solution was made and kept for use. The general method was to take 40 grams of finely pulverized material, with 10 c.c. of KCN solution (= 100 mgs. KCN) and 50 c.c. of distilled water; place all in a flask and shake well, repeating the shaking at intervals of one or two days; then filter on a dry filter into a graduated vessel; note the c.c. used for assay, transferring into an evaporating dish; add 400 mgs. of calcined lead and evaporate. The residue was then fused on a clean coal, the lead being weighed and cupelled and the button parted, as above described.

This assay is made more certain by beating the coarsely pulverized rock to redness, quenching in water, evaporating to dryness and then pulverizing, taking a sample for assay and grinding it in an agate mortar to a fine mud, and using a cyanide solution of ½%, after which the whole is transferred to a flask and made up to the desired weight of cyanide solution. The weighed sample of ore is triturated with only sufficient cyanide solution for the purpose of proper grinding. When it is transferred, as above described, to a tared flask, the pestle, mortar and funnel are washed into the flask with either cyanide solution or water. It is desirable to have a known weight or volume of cyanide solution in the flask, because it will be filtered upon a dry filter, and usually some aliquot part of the original solution will be assayed. Ore can be pulverized finer in this way than by the dry method. The assay is usually made alkaline by this treatment—a result which is beneficial for cyanide work.

ASSAY OF SEA WATER.—I have long thought that the sea water was the chief source of gold and silver and that some effort should be made to ascertain the facts and thus know what are the chances that the sedimentary rocks have been impregnated with small amounts of gold and silver. I have verified the statement of Sonnstadt that a small portion of $BaCl_2$ will throw down a portion of the gold; also the statement of Dr. Don that heating the salts to redness and redissolving and assaying the residue would recover most of the gold. I have also evaporated to dryness, and find that after dissolving in water the residue carries a notable amount of gold and silver; also, evaporating, or, rather, boiling with calcined lead acetate, fixes a larger amount of silver and some gold. The highest results were had by evaporating 1 to 10 c.c. of sea water with 200 mgs. of lead c.c., and fusing on coal; but the results were not concordant nor uniform, probably due to difference in heating and to volatilization of the silver. The gold was tolerably constant by this method; 500 c.c. were evaporated to dryness, redissolved in a minimum of water, and, while boiling, a 2% solution of $BaCl_2$ was added drop by drop to slight excess and again evaporated to dryness. The salts were beated to a bright red for ten minutes and redissolved and filtered; the ppt. of barium sulphate and some lime were placed in a flask with some water and a drop of phenolphthalein. It required four drops of lime water to produce a permanent color showing alkalinity. The solution was made up to 25 c.c., containing 40 mgs of KC, and shaken at intervals for a day—filtered and washed and the filtrate evaporated with 400 mgs. of lead and the assay made as described. There were two assays made, which showed as follows:

CYANIDE METHOD.—Found per metric ton of water:

	Mgs.
Gold	10.9
"	11.3
Mean	11.1
Silver	165.
"	174.
"	179.5

A portion of the filtrate containing the chlorides was then assayed directly with lead, which gave for Ag 1010, 1241 and 1164 mgs. per ton. The three beads were then cupelled together and parted. There was a small bead of gold estimated at 1.5 mgs. per ton, from which I conclude that the amount present in this sample was 12.6 mgs. of gold and not less than 1.500 grms. of silver per ton. Dividing by .02756, the amount of salts in the sample, it becomes per metric ton of salts:

Gold, mgs	457
Silver, grams	54.4

and for normal sea water, containing 3.5% of salts, 16.0 mgs. gold and 1.9 grams. silver. (NOTE.—Several tests showed a much higher value for the silver.)

Sea weed and floating organic matter were tested by washing sweet, calcining and cyanide. In some cases large amounts of silver were found. Samples of the bay mud taken from the dredgers gave from 3 to 18 cents in gold per ton. A sample of mud from Islais creek channel, which is very foul from sewage, gave a very high assay in silver. Samples of organic matter taken near sewer outlets assayed higher in silver than samples taken at more remote points.

As a result of the numerous tests made, I think it can be safely affirmed that organic matter reduces some silver from the sea water and probably some gold. The latter cannot be positively known, because the gold may have been carried in suspension and have become attached to the object assayed; but the method described might be used to examine organic matter taken at a point free from coastal influence. Personally, my views, based upon my work done, are that the sediments as deposited are enriched by the reducing action of organic matter and that the newly formed stratum of mud contains not only the gold and silver due to the water present, but also some additional amount reduced by the organic matter.

ASSAYS OF ROCKS.—The statement by Dr. Don that country rocks can be assayed by panning down a quantity and assaying the residue has been tested, as well as the statement that pyrite must be present in order to find gold; and my experiments show that both statements are incorrect, or, at least, not in accord with my experience.

I have found that grinding poor quartz ore in an agate mortar to a fine slime, and removing the slime by water from time to time, is a very delicate test for gold. Most of the samples assayed were thus tested and showed no gold. The method used for most of the samples was to crush to 60-mesh sieve, take 40 to 50 grms. of ore and 60 c.c. of water containing 100 mgs. of KC. The stoppered bottle containing the assay was well shaken at intervals for a day or two, filtered on a dry filter and the filtrate measured and then evaporated with 400 mgs. of calcined lead acetate and fused on coal b.b., as described. In these assays there are but two fluxes added—the lead and the cyanide—and, as both have their tenor known, great confidence can be placed in the result. As an example, take No. 10, sample of Carrara, Italy, marble: Weight taken, 45 grms. + 60 c.c. water + 100 mgs. KC.; time, two days; take 42 c.c. of solution for assay. Weight of Pb reduced 340 mgs.

Diameter of Ag Au bead, 5.45 divisions = 0.109 mm.
" Au " 1.55 " = 0.031 mm.

The following table comprises results of assays of rocks taken remote from veins or known regions of mineral values. The results are reported in milligrams per 1000 kilograms of ore assayed:

1. Granite. Porcupine Flat, near Lake Tenaya, Cal., Au, 104; Ag, 7660.
2. Granite from Lake Tenaya, Cal., Au, 137; Ag, 1220.
3. Granite from headwaters American river, Cal., Au, 115; Ag, 940.
4. Syenite from Candelaria, Nev., Au, 720; Ag, 15,430.
5. Granite from Candelaria, Nev., Au, 1130; Ag, 5590.
6. Sandstone from Colusa county, Cal., sample from Hayward Building, Au, 39; Ag, 540.
7. Sandstone from quarry, Angel Island, Cal., Au, 24; Ag, 450.
8. Sandstone from Russian Hill, San Francisco, Cal., Au, 24; Ag, 320.
9. Marble from Columbia quarry, Tuolumne county, Cal., Au, 5; Ag, 212.
10. Marble from Carrara, Italy, Au, 8.63; Ag, 201.
11. Basalt paving block from Petaluma, Cal., Au, 26; Ag, 547.
12. Diabase from Mariposa county, Cal., Au, 76; Ag, 7440.

From the above assays it is seen that the average silver is about twenty times that of the gold, or, excluding Nos. 4 and 5, the ratio is about 30 to 1, and this high ratio tends to confirm the belief that the gold and silver were deposited with the rock and have since remained with it. Assuming that the water has an underground circulation, then the source of the gold and silver can be found in the country rocks, and we need not go to the unknown regions below for a source of supply. It should be remarked that the above assays by cyanide do not purport to be the value of the rocks, but only of the amount extracted. Some check work on one of the samples showed 20% more by calcining and grinding to a fine mud. I have also found the above methods useful in cyanide tests, notably in experimental work for testing the rate of solution; from a definite amount of solution 1 to 5 c.c. is taken, and either evaporated with lead or the gold is precipitated by $AgNO_3$, and the precipitate reduced and parted, and estimated as above. The method, of course, requires some calculation for the amounts subtracted from time to time; but, on the other hand, it is all from the same sample.

The method is of great value in tests in regions remote from assay offices. One gram of properly prepared sample treated either by direct fusion or a larger amount amalgamated, and direct fusion of 0.5 gram will closely check the ordinary fire assay on ores as low as .2 ounce Au per ton.

IN the electric furnace aluminum oxide is not reduced by carbon, but if lime be added calcium carbide is formed. It has been discovered by experiment that this reduces alumina; also that the yield of aluminum is increased by the presence of free carbon. The heat should not be applied longer than fifteen minutes, for by that time aluminum carbide is formed.

Gleeson Camp, Cochise County, Arizona.*

[STAFF CORRESPONDENCE.]

Gleeson camp is near the southern terminus of the Dragoon range, 20 miles northeast of Tombstone, 14 miles south of Pearce, and 30 miles south of Cochise. The camp was started about four years ago, when John Gleeson located there a group of claims and opened what is now the mine of the Copper Belle M. Co., from which shipments amounting to about 800 tons per month of 8% copper ore have been made during the last two years. The ores also carry small values in gold and silver.

The ore bodies trend north and south, along the southern slope of the range, and are in a porphyry formation. The ores from the surface down to 75 and 100 feet depth are oxidized and consist of cuprite, azurite and malachite. From about the 100-foot level down to 300 feet, present depth of workings, the ore is largely chalcopyrite. As depth is gained the per cent of iron decreases, the gold carried increases and in places there are bodies of steel galena.

The present working shaft sinks 300 feet on an incline, but a vertical four-compartment shaft is being sunk in the more central part of the group. On the 70-foot level are drifts and crosscuts showing the ore to be about 100 feet wide. From here stopes have been carried to the surface for considerable length. On the 100-foot level there are drifts running 400 feet with the vein, with numerous 100-foot crosscuts in ore. A winze sinks from the 100 to the 200 level with stopes started from it at about every 25 feet. All ore between the 100 and 200 levels is sent down the latter through chutes, thence in cars to the shaft. There is a continuous stope from the surface to the 200 level, though below the 70 the stopes do not extend far on the strike of the ore. The stoped ground is timbered up in square sets.

The new shaft will be equipped with two cages and a large hoist. The principal stockholders of the Copper Belle are New York men. On the property is a small-tonnage matte smelting furnace, in which some test runs have been made. On the operating force are John Gleeson, superintendent; Wm. Shaw, day foreman; Nelson Stevenson, night foreman; George F. Reckhart, assayer, and F. R. O'Brien, storekeeper.

The Turquoise Copper M. Co. have a group of claims covering an ore body parallel to that of the Copper Belle, but higher up on the mountain than the latter. The developments on the Turquoise amount to considerable, there being three shafts 250 to 300 feet deep, with gasoline hoists at two of them. From these shafts crosscuts run eastward to ore, with levels along the course of the vein. At points higher up the ledge is opened through two tunnels. They have here a fair showing of copper carbonates in the crosscuts at 150 feet depth. Some shipments have run as high as 20% copper. The ore thus far is in small shoots and hunches. In places there is considerable lead carbonate. On two of their claims they have gotten into copper sulphides. The principal stockholders in this company are McKittrick, Tevis and Ryan Bros. Thomas Lawry is superintendent.

About 3 miles from Gleeson are several claims owned by Jack Mitcheson and Mike O'Connors, who have uncovered quartz veins bearing free gold. They have a 150-foot shaft, from which a crosscut runs to the ledge. The illustration on the front page shows Gleeson camp, with the hoist of the Copper Belle mine in the foreground.

Gleeson, Ariz., Jan. 8.

*See illustration on front page.

Operations at Globe, Arizona.*

[STAFF CORRESPONDENCE.]

The copper mines of the United Globe Co., at Globe, comprise the Buffalo, Josh Billings, Gray and others, which extend northeastward along the well-known globe copper belt. The ownership of this group is practically the same as that of the Copper Queen property at Bisbee. The Globe plant includes a smelter which is not now operating and shipments from the property are chiefly to furnish the Copper Queen smelter with part of its supply of siliceous ore. In the original workings of the Buffalo and contiguous ground it is shown that the oxidization extended to great depth, iron oxides coming from workings on the 700-foot level. The Buffalo has been worked mainly through a system of tunnels and the carbonate ores, above water level, are said to be pretty well worked out. More recent development, which is at the Gray shaft, is for the purpose of sinking below water level to get, if possible, into the sulphide ores. The Gray shaft is some distance northeast of the Buffalo, on the same belt. It is three-compartment and already 720 feet deep, in the foot wall formation, with crosscuts to the ore body, and drifts in ore about 2000 feet on vein at second and sixth levels. Water level is reached at 540 feet, where there is a station pump.

The property is provided with good hoisting facilities and machine shop. Some sulphide ores are ob-

*See illustration on front page.

tained in the lower levels. N. S. Berray is superintendent.

The Arizona Commercial Co. are developing the Copper Hill group, which adjoins the United Globe on the northeast. Their 450-foot shaft is 1500 feet from the Gray shaft and on the same helt. They have about 1000 feet of drifting on the second, third and fourth levels. From the surface down to near the 300 level the ores were carbonates and oxides; hut from the 300 down to present depth the work has developed a good grade of chalcopyrite ore. The shaft will he sunk to 600 feet depth. The character and extent of the sulphide ores struck here is considered important to the entire district. In 1900 about eighty cars of oxidized ores were shipped from the Copper Hill which are said to have netted about $1000 per car. The sulphide ore body opened here is stated to he 8 to 15 feet wide.

Globe, Ariz., Jan. 13.

Plans and Measurements of Capability.

Written for the MINING AND SCIENTIFIC PRESS by C. H. FITCH.

Soou after graduating from the Sheffield Scientific School I was set to making reports on manufactures of machinery, which were duly puhlished in volumes II and XXII of the U. S. Census of 1880. Among my colleagues in this work was (now) Dr. Herman Hollerith, who had just graduated from Columhia School of Mines. We were hoth quite modest, and awfully impressed with the responsihility thrust upon us by a paternal government, and Hollerith argued that we should resign to persons hetter qualified, captains of industry in steel and iron. I argued that most of these fully experienced men were fully occupied at much better salaries than the Government was ahle to pay under the census appropriation, and that our justifiahle role was to go about as young reporters seeking to tap the accumulations of other men's knowledge, and hand the draught to the puhlic. In this we met some success, but sometimes met wise and secretive people like Mr. Cramp, of shipbuilding fame, who told us pleasantly hut firmly that he knew how to huild ships, and did not care to have other people learn how at his expense. We, though young, had no private commercial reasons for withholding anything that we could learn, and the same applies to all candles, however small, that attempt to illuminate a subject. They should he allowed to shine though larger lights outshine them, and especially so if these greater luminaries keep under shades.

Many years later, and not very long since, another similar incident stiffened my nerve. I had just come from the Chicago Art Museum, from Verestchagin's pictures of the horrors of war, and thence through several galleries of colossal statuary, hut I was thinking if I should have the presumption to offer the ideas here written to the readers of the MINING AND SCIENTIFIC PRESS. Going down Michigan avenue hy the lake front I observed a colossal female figure which in dignity and heauty yielded nothing to the examples of Greek art. It stood upon the cupola of a fountain, around which I walked to get the full inscription upon the frieze: "Presented by Joseph Rosenhaum of San Francisco." I do not know the donor, hut in its purity and simplicity his was a worthy gift. It lessened the distance between Chicago and San Francisco, and gave me countenance in the idea that a Chicagoan should not be deterred from expressing his hest free thought on engineering studies in the presence of the experienced miners of the golden coast.

Capahility and incapahility assist in defining each other. I am not one of those who would say that one man was capahle, and another incapahle—the Lord have mercy upon him!—and leave him to the awakening of miracle and fate. Each has its recipe, and either may be made according to rule as a good or poor mill may he huilt according to plans.

The first essential of incapability is disconnection. The incapahle man is not geared up, not in the running. His mental processes have no go in them. Thought is in the awkward squad. It toes in, stares without seeing, is paralyzed in stupor, or galvanized into erratic action. One of the most painful spectacles I have witnessed was that of a poor man set to tend a machine with which he was unfamiliar. It was at Colt's Armory. Times were hard. He wanted to hold the job, and was seized with desperation for fear he could not. The foreman was not unkindly. "Think, man," he said, "it is not difficult if you will only observe." But he could not. There were stupid, spasmodic acts, false motions unaided hy intelligence, wild, despairing looks. At last they had to lead him away. A hypnotist might have started him all right. There are a good many jobs on which a hypnotist could increase the output.

Just as a hasket holds articles and the frame holds the pieces of mechanism, capahility holds incapahility. One of the earmarks of ahility in my line is considerateness for the less capahle. The man whose mind is clear and his mental processes in good working usually takes a certain pride in assuming hurdens which demonstrate his superiority. It suits the humor, for most forms of pleasing humor are exposures of other people's ignorance of things in which we are wise.

Considerateness is etymologically written "in the stars." It is instinctively of reserve force and superior power. A joh machine shop without the most adequate equipment is a place which in the words of an apprentice "tries the wits of the hest of them." That remark was made in a shop on the Atlantic seahoard, hut the young man who made it now has a shop in San Francisco.

"Our army swore terribly in Flanders" has hecome a familiar quotation. When I went from a genteel shop in the East to a very rough one in Ohio, I was fairly sickened hy the prevalence of the Flanders hahit. But when a man restrains his temper, and rises superior to his hard lines in the shop, he is very superior. The most courtly man I ever met, har none in state or set society, was a skilled machinist and superintendent. It was a pleasure to take his instructions, or to see him working with others.

I was once being shown a gear cutting machine hy a mechanician of world-wide reputation—the head of a tool-making firm. I cite this incident to show the almost tender patience of some capahle managers with mental confusion in others. The lad tending the machine, heing suddenly addressed, became confused, jammed a firmer into the machine the wrong way, flushed and looked emharrassed. The employer called me away instantly, and after I had followed him down a flight of stairs, not knowing what the matter was, he brought me up with the remark: "That poor hoy; he won't get over it for a week." I was slow to understand this regard for the feelings of a hoy where I was looking for nothing but an austere regard for mechanism. Had he not cares enough without concern for the state of mind of a hoy. It seemed not. This solicitude was part of his capahility.

Capahility is utilitarian culture. I define culture as the construction of systems which give us hy likeness and difference a great wealth of comparisons. The selfish person, the accutely self-conscious person has no hold hy which to escape from his own confusion of mind, in which inability he is like a crying child in a pit, from which he can only climh hy outside aid. The man must have an out-reaching mind. Only outside of himself can he get systems of comparison. Only by putting himself in the places of others can he get the mental experience, which is nothing more nor less than making canals for thought to flow in. We appreciate a Nicaragua; that canal is a great physical fact to he accomplished hy the expenditure of much lahor and money. But the thought canal which opens a man's mind to new power and a new world is left to "happen" by some convulsion of nature. I say that it can he dug and dredged by art, and that the methods of transforming a dull, incapahle into a wise, skillful mind is an engineering work in which definite courses with much lahor produce great tangihle results.

Unselfishness is not a sickly moonshine of morality. It is a lever of power to be used without sentimentality. The man who goes to the hottom of lowly things is not to he weakly approved for his humility, hut to he applauded for his engineering ahility. I have more respect for a man who has the motive and wit to prepare a "mucker's guide" than for one who, moved by the fading ideals of the past, is led to charge up the Hill of San Juan, and write a hook of "I and Me" about it.

Metals That Radiate Energy.

There ane many stores of energy in nature that may he d · wn on by properly constituted hodies without very ohvious cause. Some time since I drew attention to the enormous amount of locked-up energy in the ether. Nearer our experimental grasp are the motions of the atoms and molecules, and it is not difficult mentally so to modify Maxwell's demons as to reduce them to the level of an inflexihle law and thus hring them within the ken of a philosopher in search of a new tool. It is possihle to conceive a target capahle of mechanically sifting from the molecules of the surrounding air the quick from the slow movers. This sifting of the swift-moving molecules is effected in liquids whenever they evaporate, and in the case of the constituents of the atmosphere wherever it contains constituents light enough to drift away molecule hy molecule. In my mind's eyes I see such a target as a piece of metal cooler than the surrounding air, acquiring the energy that gradually raises its temperature from the outstanding effect of all its encounters with the molecules of the air about it. I see another target of such a structure that it throws off the slow-moving molecules with little exchange of energy, hut is so influenced hy the quick-moving missiles that it appropriates to itself some of their energy. Let uranium or polonium, hodies of densest atoms, have a structure that enahles them to throw off the slow-moving molecules of the atmosphere, while the quick-moving molecules, smashing onto the surface, have their energy reduced and that of the target correspondingly increased. The energy thus gained seems to he employed partly in dissociating some of the molecules of the gas (or in inducing some other condition which has the effect of rendering the neighhoring air in some degree a conductor of electricity), and partly in originating an undulation through the ether, which, as it takes its rise in phenomena so disconnected as the impacts of the molecules of the air, must furnish a large contingent of light waves of short wave length. The shortness in the case of these Becquerel rays appears to approach, without attaining the extreme shortness of, ordinary Roentgen rays. The reduction of the speed of the quick-moving molecules would cool the layer of air to which they helong, but this cooling would rapidly he compensated hy radiation and conduction from the surrounding atmosphere. Under ordinary circumstances the difference of temperature would scarcely he perceptihle, and the uranium would thus appear to perpetually emit rays of energy with no apparent means of restoration.—Sir William Crookes.

Notes on Testing Cyanide Solutions by Silver Nitrate.

Written for the MINING AND SCIENTIFIC PRESS by B. W. BEGEER.

Several authorities have pointed out that the ordinary methods for testing cyanide (free) in impure mill solutions do not give accurate results.

In order to find, however, a method which will give results reliable enough for ordinary practice, I made a large numher of tests on a pure cyanide solution, and several different working solutions, from the MacArthur–Forrest process.

In each case 10 c.c. of the solution was taken, exactly measured from a hurette. The tests were made undiluted and diluted, with and without KI as indicator, and also slow and quick titrating.

The results of these tests on the pure cyanide solution were practically all the same.

With the mill solutions, however, important differences were found, which brought me to the following conclusions:

The addition of KI as indicator makes the end reaction often indistinct and the results, as a rule, too high. Only in one case was it found that the addition of KI gave hetter results, and that was when the cyanide solution was exceptionally alkaline.

When the titration is done slowly the results will he too low. The differences hetween a slow and a quick titration are, however, not very large.

The following method gave the hest results: Drop into a perfectly clean flask 10 c.c. of the cyanide solution and 15 c.c. water. The solution must he perfectly clear, otherwise it has to he filtered until clear. Do not add any indicator. Titrate, not too slow, with AgNO3 solution (6.535 G AgNO3 in 1000 c.c.), keeping the solution in the flask in agitation all the time, until the solution is not more perfectly clear, hut is slightly turhid. The change from perfectly clear to a faint opalescence can be easily distinguished hy holding the flask against something hlack.

This method will give for actual practice sufficiently accurate results.

Cost of Compressed Air Hauling in a Mine.

In a paper on "Compressed Air Haulage Plants," read hefore the Engineers' Society of Western Pennsylvania on Novemher 19, 1901, Richard Hirsch gave some interesting data on the cost of hauling in a mine hy compressed air locomotives where the hauling was formerly done hy mules, of which over thirty were used. The present motive power equipment consists of two compressed air locomotives, cylinders 7x14 inches, tank capacity 130 cuhic feet, tank pressure 500 pounds per square inch, weight of each locomotive 16,000 pounds. During the year 1897 the plant was operated a total of 179 days. The cost of operating for the year 1897, and the corresponding cost of the old style of mule hauling, is summarized thus:

Total cost of plant, except steam boilers, cars and track	$15,156 00
Operating expenses, including all labor, fuel, supplies, repairs, etc	2,202 78
Fixed charges, including interest, depreciation and renewals	1,776 60
Cost of mules required for same work	4,052 48
Cost of operation by mules, including labor, supplies, interest, depreciation, etc., for 179 days	11,328 63
Cost of operation by compressed air	3,979 38
Saving by use of compressed air	$ 7,349 25

At this rate of saving the entire cost of the compressed air plant would he saved in 361 workings days.

The average daily work of these two motors during the period of 179 days referred to 1185 net ton miles, or the cost of hauling was 1.9 cent per net ton mile. The corresponding cost of hauling hy mules would he 5.34 cents per net ton mile. Had the compressed air plant been operated for 300 days in the year, instead of 179 days, at the same daily rate of work, the cost per ton mile would have heen considerahly less than that given ahove.

REAL GENIUS shows itself, not in the multiplication of petty details, hut in the assimilation of existing materials and their incorporation into a broad and comprehensive design. An engineer shows his ahility hy utilizing what materials he finds ready at hand, rather than hy the creation of special forms a little different from what has heen used hefore.

Water Supply Works for Mines in the West.

Dams aod ditches in the West always suggest the placer gold mines as original incentive for most of the coostructions, even though they may no longer he used for placer mining. The illustratioos are of typical constructions. Dams are huilt and reservoirs made in even quite small streams and valleys. In proportion to the service exacted of them they are as usfeul as the more pretentious and costly structures huilt in other localities. The miner, as a rule, huilds for his mine. He expects to work his mine out some time aod so does not huild his ditches and their head works to he imperishahle. They are sufficient if they last the life of his mine. The mountains in the West are handed with old ditch lines for the most part ahandoned for so long a time that the history of their construction has become lost.

Sidehill Coostruction of an Idaho Canal.

The Headgates of an Idaho Canal.

The Idaho canal and its headgates, illustrated herewith, are of later and more permanent construction. Sidehill ditch huilding is a special hranch of the art. Experience with ditch building on level lands gives very little assistance. The latter is nearly always io earth, where the former is very largely rockwork. There is little chance in sidehill coostructioo to use the excavated spoil to make a ditch hank against which the water can rise. The full depth of the flow, as shown in the illustratioo, must he in excavation. The wooden headwork structure is a survival of old methods and appliances. The later tendeocy is to use stone or coocrete aod make the work permanent and secure against destruction hy high water.

Dam and Reservoir on Parley's Creek, Utah.

The Discovery of Havilah, Kern Co., Cal.

To the Editor:—The writer early in 1864 noticed the indicatioos of a gold-bearing formation in the Clear Creek country when crossing it from Beals ranch to Kernville. At Kernville I engaged three men to go with me to prospect it. The distance was 20 miles, and it took us all day to make it with our outfit, and we camped at night on the Copperas branch of Clear creek, ahout the middle of where the town of Havilah was huilt. While the men were getting hreakfast, I went out prospecting close hy and in half an hour had discovered three veins of quartz showing gold. This was the heginning of the Clear Creek excitement of that year. We and others discovered ahout 200 ledges of free-milling gold-hearing quartz, some of which proved to he very rich and productive. Several hundred thousand dollars was soon invested in the mines. Shortly after the discovery we called a miners' meeting and organized the district as the Clear Creek mining district and elected Scott George, who was one of the men taken in hy me, recorder. Our laws made the charge for recording a quartz claim $5, a water right $10 and a town site $25. I located and named the town of Havilah and paid the recorder $25. Many mining towns in California were located and title secured in the same way on unsurveyed land. I consulted T. W. Freeman, a lawyer, then located at Visalia, and also State Senator from Tulare county. He told me that, as we had followed the then prevailing mode of securing town sites in California on unsurveyed land, our title was good. He afterwards hought a lot and erected a 20-stamp custom mill. Later we had Tulare county divided and Havilah made the county seat of the new couoty of Kern. At that time the miners were in the majority. Later the farmers got the majority and moved the seat to Bakersfield.

Placerville, Feh. 5. A. Harpending.

The Treatment of Clay Slimes by the Cyanide Process and Agitation.*

By E. A. H. Tays and F. A. Schiertz.

In 1893 the Aoglo-Mexican Mining Co., Limited, purchased the Guadalupe and adjoioiog mines, and, after opening up the Guadalupe, constructed a 20-stamp mill, which was started in August, 1894.

Although the results were extremely profitable (the ore heing very rich and carrying much free gold) they were not satisfactory, because the tailings were found to average ahout $20 per ton in gold. Early in 1895 the late James E. Mills made for the company a very thorough study of the suhject, and decided that the tailiogs could he treated most advantageously hy the cyanide process. In view of this opinion, Henry R. Batcheller, of Boston, was sent down in the winter of 1895-95 to experiment on a working scale. Mr. Batcheller was successful; and, duriog 1896-97, huilt a cyanide plant with a capacity for treating 1500 tons per month.

This was run until May, 1899, when all the sands suitable for the process had heen treated. The mill was stopped ahout the same time for lack of ore; hut no tailings from the mill had gone to the dump since Octoher, 1897, as the values they contained after that date were far too low to warrant further treatment. Wheo the cyanide plant was stopped there still remained on the dump ahout 16,000 tons of slimes, consisting of ahout 75% of clay slimes and 25% of sand slimes. The successful treatment of this very unfavorahle material is the theme of this paper.

Character of the Slimes.—The slimes under consideration comprised those naturally separated from the sands at the far side of the dump, and also those mechanically separated from the sands during the first run of the cyanide plant and returned to the dump. Of the 16,000 toos, 75% were, as already ohserved, purely clay slimes of the consistency of putty. All of this material would pass through a 400-mesh screen; and, although it had weathered for five years, and still contained from 18% to 20% of moisture, at least 80% of it had heen unaffected hy oxidation. There was evidently an ahsolute lack of capillary passages in it. That material which was more or less mixed with sand slimes, or surrounded the outer edges of the main dump, or lay in piles of clay halls or clods, screened from the sands treated hy percolation, was considerahly more affected hy the weathering; and the degree of extraction reached in treating it was fully 10% hetter than after we got well into the main pile. The remaining 25% of the total consisted of sand slimes, most of which would pass a 200-mesh screen. These were found in isolated hunches ahove and in thin seams helow the clay slimes. The original tailings were very fine, although the ore had heen crushed through a screeu of only 40 meshes to the linear inch. Tests made hy J. A. Edman, of Quincy, Cal., gave: sands, 49%; slimes, 51%. Of the sands, 10% passed over a 50-mesh screen; 30% over 50 to 100-mesh; 27% over 100 to 200-mesh; and 33% below 200-mesh.

Of course, the slimes (51% of the total sample) were all helow 200-mesh in fineness; and it was stated that 80% of these would pass a 400-mesh screen.

The original ore had consisted of quartz, white or reddened with iron oxide, and a lime rock (calcite), more or less mixed with decomposed country rock (andesite) from the walls and from fragments incased in the ledge proper. This ore carried much free gold, some free silver at times, lead and copper sulphides carrying gold and showing much free gold, zinc-hlende, copper and iron pyrite, and copper carhonates. The original ore also undouhtedly contained alumina; for aluminum, which had evidently heen dissolved, as well as gold, silver and copper, hy the cyanide, was found hy analysis in our precipitates.

The original samples of the tailings showed no trace of alumina—doubtless hecause they were taken, as already remarked, from near the launder discharge, which would naturally he nearly pure sand; the slimes and clay heing washed over to the far edge of the pond. Nor did those ore samples show alumina which represented only the metal-hearing quartz. But a large part of the vein material was replaced country rock, with hunches of altered country rock, all carrying gold; and in this was found the aluminum oxide.

This ore, treated hy plate amalgamation, yielded ahout 72% of its gold and 45% of its silver contents, and ahout 1.5% of concentrates, containing most of the lead, zinc and copper sulphides and iron pyrites, and part of the iron, lead and copper oxides, and a good part of the remaining gold contents (not caught on the plates, hy reason of hydrated oxide coatings or adhering particles of iron oxide and quartz).

The slimes, as run onto the dump, contained, hesides quartz, clay, etc., principally ferrous and ferric oxides (constituting 80% of the mineral contents), pyrites, minute portions of lead and copper sulphides, a little copper carhonate, and ahout $13 gold and 1.33 ounces silver per ton. The gold was in minute particles—under 0.0025 inches in diameter—

*Trans. American Institute Mining Engineers, Mexican meeting, November, 1901.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ARIZONA.

COCHISE COUNTY.

Surveyors are surveying the grounds for the Calumet & Arizona smelters, near Douglas.

It is announced that Phelps, Dodge & Co. have decided to locate their smelting plant at Douglas, 28 miles from Bisbee. Plans are now being drawn and it is expected that it will be at least eighteen months before the complete change has been made. The plans call for a plant with a capacity of 1000 to 1500 tons of ore daily. Supt. Douglas, at Bisbee, states that he is about to close up large contracts for the new machinery. It is the intention of the company to bring refractory ores from Globe and Nacozari and smelt them at Douglas. It is not the intention of the company to erect refineries in Douglas.

GILA COUNTY.

W. M. Williams has bonded at $20,000 the Miller gold mine, near Globe, from J. Miller & Co., who have worked it for several years, reducing the ore in an arrastra.

GRAHAM COUNTY.

E. Kielberg of Tucson has sold his Sixteen to One silver mine to E. S. Barnum and associates of Chicago, Ill. The mine is located in the Galiuro mountains. It is a large ledge with rich seams of silver and copper ore. There is a large body of ore which, it is claimed, gives from fifty to eighty ounces of silver to the ton and 8% copper.

The Gold Mountain M. Co., in Rattlesnake canyon, Galiuro mountains, in which Fleming Bros. of Tucson are owners, has a tunnel in 150 feet. About 100 feet from the mouth the ore taken out is free milling and runs from $6.50 to $15 per ton.

MARICOPA COUNTY.

Of the fifteen claims in the Mountain Chief group, near Harqua Hala, owned by Sparks & Devine, the North Star, War Horse and Blue Bird are the ones on which most of the work is being done. All the ore taken out is packed 3 miles on burros to the mill and from 80 to 100 tons of ore, averaging between $10 and $11 per month, have been worked monthly. The tailings can not be cyanided, and the concentrator has saved about ten tons of concentrates a month, averaging about $80 per ton.

MOHAVE COUNTY.

The Gold Road mine, near Kingman, is opened down to 200 feet and in a crosscut shows 30 feet of ore carrying large gold values. Supt. Mellarky is using machine drills both in drifting and in surface work.

H. A. Cohn of Salt Lake City, Utah, has bonded the Tom Reed and Ben Harrison mines in the Gold Road country, near Kingman, from J. Anderson, E. Hilty and D. Tooker. A shaft is to be sunk to a considerable depth at once.

S. C. Bagg of Kingman, manager of the Catherine mine of the New Comstock M. Co., reports that ore is being taken from the mine to the Arizona & New England Con. M. Co.'s mill for reduction. The cost of extracting and hauling to mill, he states, is about $1 per ton, and several hundred tons are to be treated to test values before the company puts up its own mill, which is projected of 100 tons daily capacity.

O. D. M. Gaddis and W. A. Mensch have interested George Kislingbury of Los Angeles in the American Flag mine, Wallapai mountain, near Kingman. Work has been started and the mine will be cleaned out and put in shape for examination and development.

YAVAPAI COUNTY.

The Brown Dick G. Co., operating near Prescott, is owned largely by G. B. Russell of New York and J. B. Tomlinson of Prescott. The company owns thirteen claims and has made extensive development work and erected a 20-stamp mill.

CALIFORNIA.

AMADOR COUNTY.

At the Shenandoah mine, near Plymouth, Supt. S. K. Thornton, after sinking one shaft to a depth of 500 feet, a drift was run 1000 feet south and a raise made to the surface. Here a hoisting plant has been erected with capacity for sinking 1500 feet, air compressors installed, and the upraise is being used as the start of a 1000-foot shaft.

CALAVERAS COUNTY.

A large body of pay ore has been discovered in the Angels mine, at Angels Camp, owned by J. V. Coleman. The vein is said to be over 30 feet in width and rich.

W. C. Russell, representing San Francisco people, is preparing to start a dredging scheme on the Calaveras river below Jenny Lind. He secured 180 acres of the Myers and Thompson ranches and is installing a drilling plant for prospecting.

The Sultana M. Co. of San Andreas has been incorporated to carry on a general mining business and smelting or reduction of ores. E. A. Godding, J. G. Quigley and G. W. Kimball of San Andreas are the incorporators, and Wilmington, Dela., the principal office.

EL DORADO COUNTY.

The Lucania M. Co. of San Francisco is about to develop a mine in an old river channel near Fyffe. Ground sluicing is being done and ditches are being made. C. J. Davis is Supt.

At the Noonday copper mine, near El Dorado, prospecting work is being done. One shaft is down 50 feet, with a good-sized ledge of low-grade ore in the bottom. Work in it is temporarily suspended by Mr. Wilkinson, the Supt., pending installation of machinery for permanent working. In the south shaft, 25 feet down, a drift shows a 7-foot ledge.

The School Girl mine at El Dorado is being worked by W. Felton, J. Vose, A. Hanley and J. Snider under a lease. The 10-stamp mill is being run steadily.

The Union mine, near El Dorado, has had a large hoisting plant installed on the old shaft. It is nearly ready to begin operation. Four developed pay shoots are to be worked. A. Harpending is general manager.

INYO COUNTY.

S. H. Huselton of Parkersburg, W. Va., has bonded from C. Peterson and J. McCarty a group of claims at Fish Springs. A large body of low-grade ore is to be prospected and the 5-stamp mill refitted and operated.

KERN COUNTY.

The December run of the Yellow Aster mills—one 30 and the other 100 stamps—lost but six hours and thirty minutes during the entire month. This involves the running of the five plants, the two mills and the three pumping plants. The entire expenditure during the year 1901 for the new 100-stamp mill, pumping plant and pipe line from Goler, repairs to old mill, etc., was $172,292; new development work in mine, $51,089; a total of $221,381.

MARIPOSA COUNTY.

J. B. Fontaine and M. Hart have leased the old Watson mine, near Mariposa creek, and will reopen it. The vein is about 2 feet wide, being greenstone and porphyry. The mine, it is stated, was last worked in 1854.

MONO COUNTY.

The lower tunnel of the Crystal Lake mine at Lundy will be 2700 feet long, and of this 1300 is now completed. The ground now being worked is being cut at from 43 to 45 feet per week. The tunnel is to open the ledges of the Crystal Lake mine at a depth of 2500 feet. In its course the tunnel must pass through claims owned by others at a depth from the surface of 1000 feet. The mine is already developed by workings as deep as 1200 feet from the apex.

NEVADA OOUNTY.

The Buckeye mine in Willow valley, near Nevada City, has been incorporated in New Jersey by T. B. Gray, J. T. Morgan and G. C. Shaw of Nevada City, J. H. Allen of Newark, N. J., and W. I. Sweet of New York City. T. B. Gray is president and J. T. Morgan secretary.

Work out at the old Electric, now the Grass Valley Con., at Grass Valley, is being inspected by G. W. Root of San Francisco, president of the company. An entire new plant has been put in at the mine under direction of Supt. O. Coffin, and preparation made for a thorough exploration.

J. W. Johnson of Nevada City is running a tunnel in the West Point mine near that place.

S. J. J. Sloat of Hamilton, Ohio, has bought the Mountaineer M. & M. Co.'s mine on Deer creek, at Nevada City, and has given instructions to Supt. W. Dennis to prepare to start up the mine in March. The tract of land adjoiuing the Mountaineer has also been bought.

At the Union Blue Gravel (De Noon) mine, above North Bloomfield, over 1000 feet of the 5000-foot tunnel has been run, work being prosecuted from the mouth of the tunnel and both ways from the bottom of the shaft, which is some 2000 feet from the mouth of the tunnel. Thirty men are employed.

C. Rosenthal of the Pine Hill copper mine, near Wolf, states that during the winter months development work will be done in the mine. Fifteen men are now employed. It is the intention to put in a new compressor capable of working twelve to fifteen drills, using either electric or water power machinery.

The Chicago mine at Gold Flat, near Nevada City, owned by W. Campbell of Grass Valley and W. F. Englebright of Nevada City, has been bonded to a number of miners from Grass Valley, who intend to erect hoisting works and sink a shaft.

PLACER COUNTY.

During the past season considerable development work has been done at the Daniel Webster quartz mine, near Michigan Bluff. The shaft has reached a depth of 125 feet and a number of drifts and crosscuts have been made.

T. M. Bowne, W. Rea, Jr., & Co. have everything in readiness to hydraulic at the Paragon mine, at Bath.

PLUMAS COUNTY.

The Concordia Group G. M. Co. has been incorporated at Reno, Nev., with $1,000,000 capital. The directors are G. W. Ingalls, J. S. Correcco, T. F. Dunaway, F. B. Julien, J. Sunderland and A. A. Hibbard, all of Reno, Nev., and C. G. Ebert of Redding.

SAN DIEGO COUNTY.

The stockholders' meeting of the American Girl G. M. Co. of Yuma, Ariz., elected G. D. Patten of Pasadena president and G. H. Coffin of Pasadena secretary and general manager. At the mine in the Cargo Muchacho district, near Ogilby, about $40,000 worth of new machinery has been added, making a crushing capacity of 100 tons daily. The plant consists of three sets of crushing rollers and a 100-ton cyanide plant. The average content of ore milled is $8.60. By using concentrators $5 is thus saved directly, and of the remainder $2.80 is then obtained from the tailings by cyanide treatment, leaving about 80 cents in the tailings. Fifty men are employed. T. Johnson is Supt. and W. R. Schilling foreman.

SHASTA COUNTY.

It is expected that the new plant of the Mount Shasta G. M. Co. at the Mount Shasta mine, near Shasta, will be in operation by April 1. The plant has a capacity of fifty tons per day, with motive power installation for fifty tons additional. The plant includes a large steam hoist and a complete concentrating equipment. A. S. Gibbs is Supt. The Mount Shasta Co. has ten miners, under Foreman W. F. Russell, developing the McClure group of copper mines near Bully Hill. It also has five men, under Foreman C. T. Graves, developing the Graves groups of copper claims in the Backbone district near Kennet.

It is reported that the Wynne claim on Clear creek, at Horsetown, had been sold to a company for dredging purposes.

SISKIYOU COUNTY.

J. Garvey, foreman in the Blue Gravel mine at Yreka, has started to reopen the mine at the old shaft. While getting out gravel from the old shaft, a new one will be sunk lower down the channel. The mine is being operated by a Cripple Creek, Colo., company, represented by J. C. Whipp of Yreka. This company proposes to obtain additional ground extending northward to the Yreka town limit. It is also reported that the Greenhorn No. 2 mine is to be opened in the near future with better pumps and a more powerful steam plant.

TUOLUMNE COUNTY.

Ten stamps of the Crystalline mill, near Jamestown, are being operated steadily on fair grade ore. The new gallows frame and hoist have been completed. A larger air compressor is being installed.

The improvements at the Harvard mine, near Sonora, are being completed rapidly. The gallows frame over No. 1 shaft has been raised and the concrete foundation for the hoist and engine is ready.

The Mustang mine, near Confidence, has been bonded to the Mustang M. Co., who have commenced development work by contracting to have the main tunnel pushed ahead 300 feet and an upraise then made to the surface. J. P. Oliver is Supt.

At the Hazel Dell mine, near Sonora, tests are being made preparatory to putting a reduction plant in at the mine. The mine has a large body of sulphide ore.

Three quartz claims, recently discovered near Yankee Hill by G. Mapes and N. Judson, have been bonded to H. C. Kennedy of San Francisco.

The shaft in the Golden West mine, at Sonora, is 60 feet below the tunnel level, and a heavy inflow of water has stopped sinking until pumping machinery is installed.

The shaft on the Lost Fox mine, near Sonora, is down 200 feet and shows an 8-foot ledge of gold-bearing ore. A sawmill has been built to cut the timbers for a 20-stamp mill to be erected.

COLORADO.

CHAFFEE COUNTY.

The first furnace of the reconstructed smelter at Buena Vista will blow in March 1, and the other furnaces will be pushed to completion as rapidly as possible. When all are in operation 600 tons a day can be handled.

CLEAR CREEK COUNTY.

The Gem Extension mine, near Idaho Springs, W. E. Renshaw manager, has opened into 4 feet of solid smelting ore in the vein near the Newhouse tunnel at a depth of 2000 feet below the apex. It will run, it is claimed, from 50% to 80% galena.

Manager Linn of the American Gold Standard Co., operating near Idaho Springs, has tested Black Eagle ore by the cyanide process with good results. The mill has a capacity of twenty-five tons a day and in a four weeks' run has made a saving of 80% of the values on the lowest grades. The value of the ore is about equal in gold and silver.

The Detroit M. & R. Co. has been incorporated at Idaho Springs, capital $75,000, and is preparing to build a mill of 100 tons capacity at that place. T. B. Crow is vice-president and manager.

The Woodbury M. & M. Co., organized to work the Abeel group, near Empire, as the result of a few months' work have an adit driven on the Abeel lode extended and three veins intersected. An 80-foot drift on the Bimetallic lode carries ore that will run about $12 per ton, with a streak of solid ore that assays as high as $95 in gold and silver. Arrangements for power drilling are being made, and the erection of a mill is contemplated.

The new compressor has been placed at the Newhouse tunnel at Idaho Springs and the company will now be able to supply the various mines working through it with sufficient air. The heading is now being driven at the rate of 9 feet per day.

GILPIN COUNTY.

Manager H. I. Seeman of the Yankee Con. mine at Yankee is opening several veins at an increased depth. He says that a new plant of machinery for the tunnel is to be bought immediately, after which it will be driven with machine drills.

J. Gilmour, Supt. of the Stewart mine, near Central City, says returns from a 25½-cord lot of mill dirt on the plates yielded 89.67 ounces, in value $1,466.35, and made twenty-two tons of tailings which sold for $401.09, a total of $1,867.44.

JEFFERSON COUNTY.

C. R. Critchell has had tests made on ores from his claims 18 miles west of Littleton, which show good values in bismuth, silver and tin.

OURAY COUNTY.

C. E. Blake has sold the Last Chance and Forest Queen mines, near Ouray, to A. E. Cox of Huntington, W. Va., who propose to organize a close corporation to work them in connection with the Great Western and Sun Down mines adjoining. The new owner, it is reported, has bought $10,000 worth of mining machinery and will drive a 1000-foot tunnel.

RIO GRANDE COUNTY.

At Liberty several companies are now developing properties in the Sangre de Cristo range. In this district, which is known as Music pass, a new town has recently been started called Chapin. The Blanca Mutual M. & M. Co. at this place are now erecting a mill to treat the ore from one of their mines, and it is claimed that this district is soon to have another mill.

SAN JUAN COUNTY.

The Red and Bonita mill, near Gladstone, has been running steadily, being operated by the Great Mogul people on ore from that mine. About seventy tons are treated daily. A force of seventy-four men is employed—fifty-seven at the mine and seventeen at the mill. In the spring the company expects to erect a tram line.

The Silver Ledge Co. is receiving bids on the machinery and contract work for erecting a 100-ton mill in the spring. The mill will be located at Chattanooga and a tram built to connect with the mine.

SAN MIGUEL COUNTY.

Contracts have been let for the construction of the new mill of the Tom Boy G. M. Co., at Telluride, and active operations will begin immediately. This mill will contain sixty stamps. In addition to the mill, contracts have been let for the building of a large tunnel house, timber shed and blacksmith shop at the mouth of the Argentine tunnel, and a large combination bunk and boarding house, which will contain the mine offices and have bath rooms, electric lights and steam heat.

The Gold Metal M. & M. Co. has been incorporated, capital $750,000, with E. E. Payson president, P. M. Fennis secretary, W. H. Brehmer general manager, and F. M. Hill Supt., to work eleven claims near Telluride, and formerly owned by J. Johnstone & Co.

SUMMIT COUNTY.

(Special Correspondence).—The Puzzle M. & R. Co., J. F. Callbreath manager, has a lease and option on the Puzzle mine at Breckenridge; also on Puzzle extension

claim. The former is developed through a 1500-foot tunnel on the vein, which has been stoped out above tunnel level. A winze is being sunk from the tunnel and the lattor driven ahead into Puzzle extension ground. The ores comprise an iron-lead sulphide, with gold, silver and lead values. A 50-ton concentrating mill is being equipped to concentrate the low-grade ores.

Brockenridge, Feb. 5.

TELLER COUNTY.

President Burns' eighth annual report for the Portland G. M. Co. says the corporation now owns thirty-six mining claims or fractions thereof, comprising a solid body of little more than 200 acres. The report of Mine Supt. Trevarthen says the total development of the mine to Jan. 1, 1902, was 20 miles 1240 feet. Total development during 1901, 3 miles 2691½ feet. The production for 1901: Net tons, 76,905,550; ounces gold, 120,339.473; ounces silver. 2,909.977; gross value, $2,408,413.23; treatment charges, $625,999.67; freight charges, $21,474.31; net proceeds, $1,760,-939.25. Mine Engineer Kurio says that during the year 147,912,898 gallons of water were pumped from the mine.

The Star G. M. Co., which has been developing the Home Fraction, near Cripple Creek, has opened up a shoot on the 300-foot level that it is claimed runs $85 in gold to the ton from a 3-foot breast. J. F. Erisman is manager.

Mr. Cone of Canyon City is doing work on his Ophir claim at Cripple Creek. A three-compartment shaft is being sunk to the 1000-foot level and a steam plant with a sinking capacity to 1500 feet is to be installed. Large ore bins are also under construction.

The El Paso Con. Co. at Cripple Creek is now working ninety men, of whom eighty-eight are working on development entirely, and only two men are breaking ore. One machine drill is breaking enough ore to pay all the operating expenses of the property, and is being worked in the tunnel level in an ore breast 40 feet in width.

D. D. Short and W. P. Wilhur have taken a lease on the tailings which have accumulated at the Economic mill, near Victor, together with the prospective accumulations of the next two years, and are to build a plant for their treatment.

W. S. Stratton, it is reported, contemplates erecting in the near future a 600-ton cyanide mill to treat ore from his low-grade deposits.

The system adopted by the Moon-Anchor Co. at Cripple Creek, in leasing, is considered satisfactory both by the lessees and the company. This system, which was put in operation some time ago, is that the company furnishes everything, including powder, drills, candles and the hoisting of the ore, and receives 50% of the receipts from the sale of the ore.

IDAHO.

The Mount Pisgah M. & M. Co. has been incorporated in Salt Lake City, Utah, capital $45,000, with J. Sindar as president and M. Thomas secretary. The company owns the Overland Nos. 1, 2, 3, 4, 5 and 6, Old Crow and Little Joint claims in the Mount Pisgah district.

IDAHO COUNTY.

W. Moore and C. Camphell of Walla Walla, Wash., have given an option on three claims in Thunder mountain to H. T. Hendricks of Baker City, Or., at $150,000.

It is stated that the Rocky Mountain Bell Telephone Co. has bought the material for a telephone line to Thunder mountain, the work of construction to begin as soon as the weather will permit. It is thought the work can he completed within three months. The line will be run from Boise, via Idaho City, and will be about 150 miles long.

KOOTENAI COUNTY.

A quartz and placer strike has been made on Renfro creek, about 6 miles from Tyson camp, across the St. Maries river. Mr. Griffiths of Tyson says the first ledge was discovered in January. The ledge is said to be 3 feet wide, with free-milling gold ore. He says that the placer prospect is very fine, as high as $1 to the pan having been taken out.

LATAH COUNTY.

The Jerico quartz mill, near Elk Creek falls, 55 miles east of Troy, is a 3-stamp plant, twenty-five tons per day capacity. The mill is being taken in from Troy over the snow. The mortars weigh 7000 pounds each and the grizzly 4200 pounds. The shaft on the Jerico mine is down 125 feet and has developed ore assaying $35 per ton. The company has put in a 12 H. P. gasoline hoist, a 4 H. P. gasoline engine to run the concentrator and will install a 16 H. P. gasoline engine for the mill.

OWYHEE COUNTY.

The electric machinery for the Poorman mine, at Silver City, has been installed and the pump started to unwater the deep shaft. The power comes from the Swan Falls electric power plant on Snake river. Three large mines, the Dewey tunnel and two big mills are operating their machinery and are lighted, and Dewey City and Silver City lighted, by this power.

MONTANA.

The January, 1902, receipts of gold at the Helena assay office amounted to $190,760, against $159,425 in January, 1901—the largest receipts for that month in the history of the office. The gold was practically all from stamp or cyanide mills.

FERGUS COUNTY.

The New Year G. M. Co. is again on a paying basis, and, pending completion of the new plant, the old mill is run to its full capacity—fifty-five tons per day. With the starting up of the cable tramway twenty-five men were put to work. The tramway is conveying seventeen tons per hour, which can be increased to twenty-five tons. With the entire new plant in operation about 250 tons of ore will be treated daily. The new cyanide mill will contain five tanks with a total capacity of 540 tons, two of them holding 150 tons apiece. The ore found in the New Year claims is well adapted for treatment by the cyanide process and can be handled, it is claimed, at a cost of 40 cents per ton.

The Kendall G. M. Co. has bought the Agnes and Gulch mining claims at Kendall from C. Allen. The properties are prospects with surface showings which it is thought on development will prove them to be a valuable addition to the Kendall mines.

LEWIS AND CLARKE COUNTY.

The Winscott mine at Helena has been sold to the Big Indian M. Co., A. C. Mason of Tacoma, Wash., president and manager. A contract for a 60-stamp mill of 300 tons daily capacity has been let, and it is expected to have it completed by July. The stamps are to weigh 900 pounds each. The mill will be operated by electricity from the Missouri River Power Co. from Canyon Ferry, a contract for 150 H. P. having been let, and the mining company will build a pole line 4½ miles long to conduct the power to the mine. The mine is a mountain-like deposit of low-grade ore, free milling so far as it has been developed. The development consists of a quarry opening about 300x140 feet on the surface.

MADISON COUNTY.

The Old Joe mine, at Pony, owned hy J. Nelson and F. P. Reinoehls, has been bonded by Butte people for ninety days at $30,000. Seven men have been put to work on the property. The mine is considered a big low-grade proposition. It has produced considerable shipping ore while being developed.

SILVER BOW COUNTY.

The vein opened hy Farrell shaft No. 3 contains a 6-inch streak of exceedingly rich ore. It is claimed that it assays 1000 ounces in silver and 50% copper. Outside of the rich streak there is a large body of ore that assays about 30% copper and some silver.

NEVADA.

Through the sale of the Nevada railroad hy A. P. Stokes to the Nevada Midland Railroad Co., incorporated in New Jersey with a capital of $1,750,000, a railroad scheme to reach Tonopah has been started. The Nevada Central railroad, which runs from Battle Mountain, Nev., on the line of the Southern Pacific, to Austin, will he extended south 112 miles to Tonopah. S. Bamherger, of Salt Lake City, Utah, is president of the company.

ESMERALDA COUNTY.

F. G. Humphrey has discovered what is supposed to be a valuahle turquoise mine, near Crow Springs, on the road to Tonopah.

EUREKA COUNTY.

The Excelsior M. Co.'s statement of the business transacted by it in Nevada during the year 1901 shows: Received from sale of ores, $57,123.60; dishursed for lahor, supplies, freight and expenses, $46,429.66; net gain, $10,693.94.

NYE COUNTY.

D. Fitzpatrick has bonded the Maggie May claim and commenced sinking a shaft to go down 60 feet before crosscutting.

Last December E. Clark started out to prospect the country north of Tonopah and made a new discovery situated about 12 miles northeast of Tonopah. The ledge, or lode, can be distinctly traced for 5000 feet, being covered in places with only a wash deposit of a few inches, and pay float is found in the gulches and on the hillsides. Along the ledge the croppings are shipping ore. On the Horn Silver claim on this ledge, owned by L. O. Ray, out of the twenty-two assays taken along the croppings of his claim the lowest return was $50 in gold and silver and the highest was $366.70. The ore carries from 15% to 60% lead in the carbonate. A shaft down 12 feet showed the ledge 3 feet wide, with ore assaying $266 silver and $23 gold per ton. Many working leases have been taken by Tonopah people.

WHITE PINE COUNTY.

The Rocco-Homestake Nevada M. Co.'s statement of business transacted by it during the year 1901 shows: Received from ore sales and other sources, $70,-185.96; paid for expenses, labor, hauling, freights, etc., $58,314.05; net gain, $11,-871.91.

NEW MEXICO.

GRANT COUNTY.

The Michigan-New Mexico Copper Co. is working on its claims in the Little Burro mountains. On the Copper Dyke mine the shaft, down 40 feet, is following a 3-foot vein of shipping ore. Assays give average values of 11% copper and $5.50 gold and silver per ton. The shaft will be sunk to a depth of 150 feet. The same company is working the Iron Dyke, in which, under the iron cap, hematite was encountered which assays 65% iron.

G. H. Utter is developing the Cleveland Copper group at Pinos Altos and has opened up several veins of ore.

TAOS COUNTY.

The Wayne Arriba M. Co. has been incorporated, capital $1,250,000, with G. A. Kirker president and S. Clarke secretary and treasurer, both of Detroit, Mich., to develop mining property in the Bromide district, about 14 miles from Tres Piedras, where it has four claims, two of which are now under development.

OREGON.

BAKER COUNTY.

The cyanide plant of the Perry and Rachael property, near Baker City, operated by the Aurora G. M. Co., has been completed. The company has ordered a new pump for deeper sinking.

The Richmond group of mines at Bonanza, near Baker City, is to be reopened by E. D. LeClare, the owner.

The Empire mine, near Baker City, has been leased to the Phœnix G. M. Co., which has made arrangements to do a lot of development work at once. There is a 10-stamp quartz mill belonging to this mine which will be run.

GRANT COUNTY.

W. Wade, manager of the Scandia M. & T. Co. of Spokane, Wash., operating on Quebec hill, near Granite, reports that the tunnel has cut through several small veins of gold-hearing ore. The tunnel is now in 1300 feet of the 3000 feet total length estimated before the work is finished. It is 7x7 feet and is fitted for two tracks. The first big vein will he tapped at a depth of 900 feet—the tunnel will reach in about 400 feet—the second ledge will be struck at a depth of 1000 feet and the third at a depth of 1200 feet.

J. H. Warner has sold a half interest in the Black Hawk mine, in Greenhorn district, near Granite, to a Pittsburg, Pa., capitalist for $75,000. The mill is under construction. A 100-light dynamo will also be installed.

JACKSON COUNTY.

At the Bowden mine, near Gold Hill, ore that averages $100 per ton has been uncovered at a depth of 200 feet in a 3-foot ledge. It is owned hy Houck & Haff.

JOSEPHINE COUNTY.

Riggs & Flamm have made a rich gold quartz discovery in the Grave Creek district, uncovering a large ledge, from which tests made show it to carry from $32 to $90 per ton, mostly free gold.

W. Bailey, M. E., manager of the English-Canadian Co., which owns the dredger "Josephine" near Waldo, is arranging to resume operations with it.

A new cyanide plant has been installed at the Gold Bug mine, in the Mount Reuben district, to work tailings which run $15 per ton. A new two-cage hoist and additional stamps are also to he installed at the Gold Bug. Development in this mine is proceeding by five levels, the longest being 750 feet, and a depth of 350 feet being reached. The ore body is found in a vein possessing a width of 16 feet and carrying an average value of $30 per ton. The monthly clean-ups are said to run from $12,000 to $15,000. A 5-stamp mill and thirty men are employed. The Gold Bug is the property of S. P. Jones of Nevada, S. L. Jones and H. M. Gorham.

What has long supposed to have been lead, or some other comparatively worthless metal, and which has been found in quantity in the Myrtle creek placers, near Grants Pass, and thrown away hy the miners, is now found to be native silver, so a report from the locality states.

UMATILLA COUNTY.

Twenty-five placer claims have been made on the north fork of the John Day river. It is only recently that this part of the John Day river has become known as a placer mining country.

SOUTH DAKOTA.

The National Smelting Co. of Boston is building a 500-ton smelter at Rapid City that is expected to be in commission in April. The building is of steel frame with corrugated iron sheathing, and is 150x200 feet. It is built in two floors, the ground floor having the boilers, engines, blowers, furnaces, refinery and dynamo for electric lighting. The second floor is divided into a feed room where the furnaces are charged, and the sampling works. The smelter has two furnaces, one for lead, 36x120 inches in the clear, and one for matte, 36x144 inches, both water jacketed 20 feet. There is room for four additional furnaces when desired. H. H. Muggley of Boston, Mass., is general manager at Rapid City.

UTAH.

JUAB COUNTY.

The Buckeye M. Co. at Diamond, in Tintic district, has been reorganized and systematic development is to be started.

SALT LAKE COUNTY.

The Dalton G. M. Co. of Salt Lake City has elected B. A. McMillan, J. H. Lakin, C. M. Garrison, A. H. Adkinson, T. B. Beatty, C. H. Dowse and O. R. Young directors. The report of O. R. Young, manager, states that during 1901 1050 feet of work was done in the mine at Bingham and considerable $6 to $20 ore exposed in the different workings. Surveys have recently been made for a tramway from the mine to the mill, a distance of 7000 feet, and he recommends that one be put in.

TOOELE COUNTY.

It is reported that the Con. Mercur M. Co. will complete the Electric tunnel by extending it through to connect with the Lulu territory. At present the transportation and mining of the ores cost about $1 per ton, the ores that are extracted from the southern portions of the company's ground going to the mill by rail. This expense will have been entirely overcome with the proposed extension of the tunnel.

WASHINGTON.

FERRY COUNTY.

Connection has been made between the lower and upper workings of the Lone Pine mine, at Republic, owned by the Lone Pine-Surprise M. Co. The raise is 70 feet in height in the ledge, where it is from 12 to 15 feet wide. The ore is claimed to have an average value of $19 per ton. Supt. P. Creasor says that he can take out 100 tons daily for several months. He says the company will make the continuation of No. 2 tunnel for 200 feet, and make the installation of a large compressor and hoisting plant on a large working shaft to be sunk 600 feet. The compressor plant will be of 10-drill capacity, and, when installed, it will furnish the necessary air to operate two small hoists, one on the Surprise and one on the Pearl claim.

FOREIGN.

BRITISH COLUMBIA.

(Special Correspondence).—J. Caplice of Butte, Mont., who owns a number of copper properties near Atlin lake, says the winter prospecting is making a good development and that in a tunnel cut there is 70 feet width of solid ore, running from 6% to 24% copper. The Lakeview gold quartz properties near Atlin, under bond to R. D. Fetherstonhaugh, have been sold to a Philadelphia company. There is a high-grade free-milling quartz strike reported from Boulder creek, where the placer miners have been drifting this winter. J. M. Ruffner is developing quartz properties on Pine creek, opposite the original placer discovery. The new map of the Atlin district is well under way and will be ready for publication about April 1.

Atlin, Jan. 25.

A body of high-grade ore 3 feet wide has been discovered in making a raise from the fourth level of the Fern mine. The ore shows in the floor of the level 160 feet above on the vein, so that the extent of the shoot is large. The Fern has been under lease to A. J. Nichol of Nelson.

R. Findlay of Atlin says that a company of Atlin mine owners, associated with W. A. Clark of Butte, Mont., will build a smelter at Atlin this year. Work will be started early in the spring and the site is now being surveyed at the Atlin lake end of the Taku Arm-Atlin portage, which is centrally located.

J. N. Greensides, K. C., of Montreal, a director of the Montreal-Boston Copper Co., which owns the Sunset mine in Deadwood, is negotiating to buy the pyritic smelter at Boundary Falls. The Sunset property is now opened so as to ship 400 tons of ore daily.

The preliminary operations for the erection of the Osborne Bay copper smelter for the Mount Sicker copper mines have been started and the actual

work of construction is to he soon hegun. The contracts for the grading of the site for three 200 H. P. hoilers and for the masonry, timber and wharf have heen let. The plans and specifications for the wharf call for a structure 750 feet long, equipped with double tracks for narrow and standard gauge cars and a ferry slip with three tracks, so that three cars may be landed from the ferry simultaneously. The intention is that copper made at the smelter will he shipped to New York direct. There will also he an ocean dock to receive ores from Alaska.

The extensive improvements at the Canadian smelting works at Trail have been completed. The new automatic crusher and sampler, having a capacity of 150 tons per hour, has been tested satisfactorily. A system of electric tramways has been installed to connect the roast heaps with the main works. The lead stacks have heen hlown in. The starting of the copper furnaces waits on shipments from the Center Star and War Eagle mines at Rossland. The plans for a refinery to treat silver-lead matte are finished and construction is to be commenced immediately.

The Velvet mine at Rossland has made a contract with the Hall smelter at Nelson for the treatment of its ore and will ship a car daily, commencing at once. According to the manager's report, this is $20 ore from below the 400-foot level in the mine.

A company has heen formed in London to reopen the Hardie mountain cinnabar mine, near Savonas. J. Luce is Supt. Later it is intended to erect furnaces for the treatment of the ore.

The Cinnabar M. Co., Ltd., has decided to reorganize and increase the capital stock from $100,000 to $500,000. This company has twelve claims near Kamloops and several years ago erected a furnace with a capacity of thirty tons a day.

The Mines Exchange, Limited, of Nelson, B. C., says:

The Iowa M. Co., on Tracey creek, East Kootenay, have let a contract for the driving of 100 feet of tunnel. The ore in the Iowa is galena and carries some copper and gold. The pay streak is 2 feet wide of clean ore in a ledge 6 feet wide.

The Arlington Co., in the Slocan, has hought the Amos and Amos Fraction from R. Bradshaw and James Orr. The claims adjoin the Arlington.

The ore shoot in the Silversmith mine at Slocan has widened out to 4½ feet of solid high grade steel galena. Assays as high as 1500 ounces to the ton have been had, while the whole vein will run several hundred ounces. The Silversmith belongs to the Byron N. White Co.

Shipments from the Granby mines at Boundary now amount to a minimum of 1000 tons of ore every day, two trains of seventeen cars each being required to handle the output. It is expected that in a short time the shipments will further increase to 1500 tons per day, when the two new furnaces of the smelter are blown in.

The Arlington mine of the Hastings Exploration Syndicate, at Erie, has 100 men at work, and for the past ten days has been shipping at a rate of two cars per day, one-third of which is concentrates, the halance heing crude ore.

The tramway at the Silver Hill, Crawford Bay, has been completed and is in successful operation. It is 2 miles long, being of the douhle rope system, the buckets carrying 1000 pounds each, and the tramway having a capacity to deliver 200 tons per day. The lower terminal is at a point 9 miles from Kootenay lake, to which the ore is hauled hy wagon.

The returns from the Le Roi No. 2 for the month of Decemher are given as follows: Ore shipped, 5025 ton; contents, 2215 ounces of gold; 7650 ounces of silver; 122 tons of copper; gross value, $89,000. To be deducted—Smelter charges, $41,500; cost of mining, $15,000; ore tax for quarter, $2900. Total deduction, $59,400. Estimated net profit, $29,600.

KLONDIKE.

A stampede is reported from Dawson to Gladstone creek, a trihutary of Indian river, where the discoveries of gold-hearing conglomerates are reported. The Gladstone creek strike is of placer gold. This same ground was staked in 1898, when all the creeks were overrun, hut the claims were allowed to lapse without heing fully prospected.

MEXICO.

B. T. Scott, general manager of the Venice C. M. Co., has arranged to install machinery at the mines at Soyopa, Sonora. A 42-inch water jacket smelter will he erected. The company has claims aggregating 120 pertenencias. Upon one they have ahout 1200 feet of tunnel and crosscutting, exposing sulphides and oxides of copper.

E. B. Wiggins of the Alamo, Lower California, mining reglon, has brought to San Diego two gold bricks, the product of the cyanided tailings taken from the Aurora, Evelyn and Princess mines. Wiggins has heen in partnership with J. H. Packard for two years, and during that time they have made $20,000 net hy operating the cyanide plant. The plant will later be moved to Barstow, Cal.

At Suaqui Grande, Sonora, the Chicago & Sonora Placer M. Co. are preparing for operations on a considerable scale. Ahout 100 tons of machinery are on the ground and en route.

W. S. Morrow, manager of the Grand Zodiac M. Co. at Suaqui Grande, Sonora, says the company has at the mine a 5-stamp mill, Wilfley concentrating table, and a 60 H. P. engine and boiler, which will be set up and put into operation at once. With the power other hatteries of stamps and concentrators will be added as needed.

TRANSVAAL.

The annual report of the Randfontein Estates G. M. Co., dated December 23d last, states that no damage had been done to any of the mines of the company during the war. On the surface very trifling injury was done, hut everything connected with the mines and the surface work has been put into good order again. It was decided just about the time when the war started to increase the stamping power of all the mines from 60 to 100 stamps each. The Porges, South, North, Rohinson, Block "A" and Mynpacht Randfontein mines will within a very short time have each of them, 100 stamps working instead of 60. All the stamp machinery has heen made during the war and forwarded to South Africa.

Personal.

J. F. SMITH is Supt. Phœnix mine, Liscum, Ariz.

H. A. COHEN of Salt Lake City, Utah, is at Kennet, Cal.

R. BROWN is Supt. Emancipation mine, at Wall Street, Colo.

E. AUSTIN is Supt. of the Fenochia mine, near Fronteras, Ariz.

W. F. STAUNTON will act as manager Tombstone M. Co., Bishee, Ariz.

W. A. FARISH of Denver, Colo., recently made a trip to New York City.

J. LEATHAM of Nevada City, Cal., is Supt. of a mine at Casa Grande, Ariz.

L. KILLEEN is manager for the Belene Copper Co. at Copete, Sonora, Mexico.

J. P. EVANS, auditor Colorado Iron Works, Denver, Colo., is in Los Angeles, Cal.

COL. FRANK MCLAUGHLIN of San Francisco and New York is in the former city.

A. J. CAMPBELL has been appointed Supt. Isabella G. M. Co., Cripple Creek, Colo.

J. A. CHURCH, formerly of Tomhstone, Ariz., is examining mines near Prescott, Ariz.

J. S. MCCULLOUGH has been appointed Supt. of the Dalton mines at Richfield, Utah.

G. SPAULDING AND W. M. STATLER of Yuma, Ariz , are in Lower California, Mexico.

W. A. DOBLE has returned to San Francisco from a business trip to Los Angeles, Cal.

M. W. MATHER has returned from San Francisco to the Plumhago mine, Nevada county, Cal.

JOSEPH DEBONS is Supt. Pat Goggins gravel mine, at Michigan Bluff, Placer county, Cal.

B. F. DIBBLE, manager Harvard M. Co., has returned from Jamestown, Cal., to Boston, Mass.

C. A. BURCHAM has been appointed Supt. of the Yellow Aster mines and mill at Randshurg, Cal.

LEWIS SEARING, manager of the Denver Engineering Works, was in Chicago, Ill., on the 8th inst.

U. G. CARPENTER, manager of the Pass Me By Tunnel Co. at Carpenter, Colo., is in New York.

J. P. OLLIVER has heen appointed Supt. of the Mustang mine at Confidence, Tuolumne county, Cal.

S. P. TRAYLOR is now the New York City representative of the Colorado Iron Works of Denver, Colo.

J. E. BAMBERGER, manager of the Daly-West mine at Park City, Utah, has returned from New York.

W. J. LORING, late of Calaveras county, Cal., left San Francisco for Kalgoorlie, Australia, on the 8th inst.

R. WHITE, Supt. of the Highland Boy smelter at Bingham Junction, Utah, was in Butte, Mont., on the 10th inst.

LEWIS T. WRIGHT, manager of the Mountain Mines, Ltd., at Redding, Cal., is in New York to meet Managing Director C. W. Fielding, who comes there from London.

C. W. HOWARD JR., manager of the Spenceville copper mine at Spenceville, Cal., is sojourning in San Francisco, Cal.

H. TURNER of Steamboat Rock, Iowa, is now with the Minas Prietas Reduction Syndicate at Minas Prietas, Sonora, Mexico.

J. N. WILLIAMS of Boulder, Colo., who has been examining mines in southern Oregon, ls now sojourning in Los Angeles, Cal.

R. D. GRANT, who has heen in British Columbia, examining a mining proposition, has returned to Salt Lake City, Utah.

S. D. NICHOLSON is to be manager of the A. Y. and Minnie mines at Leadville, Colo., under the new ownership of these properties.

J. LUCE, late manager Cactus M. Co., at Milford, Utah, has been appointed Supt. Hardie Mountain cinnahar mine, near Savonas, B. C.

V. V. CLARK, formerly manager of the Higueras G. M. Co. at Agua Caliente de Baca, Mexico, has opened a mining office at Alhuquerque, N. M.

G. H. GRUSS, formerly of Genesee, Plumas county, Cal., is now in charge of the mill of the Golden Horseshoe M. Co., at Kalgoorlie, West Australia.

F. C. SCHRADER of the U. S. Geological Survey will spend the summer in a reconnoissance geological survey of the Copper river country in Alaska.

C. CANTRELL, who was foreman at the Union mine, at El Dorado, Cal., for several years, has been appointed foreman at the Montezuma mine, Nashville, Cal.

M. M. O'SHAUGHNESSY has recently returned to San Francisco, Cal., from several months' sojourn in the Hawaiian Islands, where he has heen engaged on large water works construction.

ROBERT MCF. DOBLE of San Francisco, Cal., is in British Columbia, engaged in the examination of hydro-electric transmission projects for the city of Vancouver and vicinity.

WRIGHT H. AUBURY of Los Angeles, Cal., has taken the superintendency of the Pacific M. Co., a Minnesota company that will do considerable development work in the vicinity of White Hills, Mohave county, Ariz.

CHESTER W. BROWN, manager Inca M. Co., left San Francisco for Tirapata, Peru, on the 11th inst. With him went Jesse J. MacDonald as assistant general manager. Mr. MacDonald goes on a two years' contract at an annual salary of $6000 and expenses.

Commercial Paragraphs.

THE Scully Steel & Iron Co. have established an agency in Denver, Colo., with N. L. Wright as sales agent.

THE Dearhorn Drug & Chemical Co. of Chicago, Ill., have established a branch at Denver, Colo., with George E. Talcott as Western manager.

THE Weigele Pipe Works, Denver, Colo., are completing their new shop, which will he equipped with new and up-to-date appliances.

THE San Francisco, Cal., office of the Westinghouse Electric & Mfg. Co. is to he removed from the Mills Bldg. to corner First and Market Sts. about May 1, 1902.

G. E. ALEXANDER'S new assay and ore-testing plant in McPhee Bldg., Denver, Colo., includes facilities for cyanide work, concentration, amalgamation and slime settling.

THE Denver Engineering Works Co. have estahlished a city office at 604 and 605 McPhee Bldg., Denver, Colo., their works heing at Thirtieth and Blake streets in the same city.

THE Boston & Montana and Anaconda C. M. companies are stated to have installed at Great Falls, Divide and Anaconda, Mont., Stirling water tube safety hoilers aggregating 12,000 H. P. Further statement is made that "the new smelter on Washoe hill, Anaconda—the largest reduction works in the world—contains one plant of 4800 H. P. of Stirling hoilers."

THE Cataract Power & Conduit Co. of Niagara Falls has recently awarded to the Westinghouse Electric & Mfg. Co. a contract for seven 2500 H. P., oil-insulated, water-cooled transformers. These transformers will he wound for 2200 volts, two-phase, to 11,000 or 22,000 volts, three-phase, and will duplicate the present equipment in the transformer house at Niagara Falls.

THE Allis-Chalmers Co. received an order through their Salt Lake, Utah, office, H. V. Croll manager, for a 60-stamp mill, each stamp weighing 850 pounds, from Allen C. Mason of Helena, Mont. The mill will be built on the Winston property, 4 miles from Helena, and will be driven by three electric motors—two for the sixty stamps and one for the large Gates crusher. This mill will have several new features in its construction, among which is a special new design of conveyor for the ore bins, and heavy cast iron anvil blocks placed under the mortars, which rest upon a large concrete foundation, instead of the usual wooden mortar block. This construction, it is believed, will increase the crushing capacity of the stamps from 20% to 25%. It is expected the mill will he in operation hy June 1, 1902.

THE Pacific Coast Ore Sampling Works has completed its new huilding at Adam's wharf, Oakland, Cal. Up-to-date mechanical appliances for the speedy and economical handling of ores have been installed, and the plant is claimed to rank in efficiency with any in the country, the assaying department being especially perfect in equipment. Receipts of ore from several districts are already heing received and handled. The works are under the direct management of J. Bruce Gibson, the owner, who was formerly connected with the Puget Sound Reduction Co., of Everett, Wash.

BAKER & Co., gold, silver and platinum refiners, of Newark, N. J., and New York, say: "As a number of rumors have reached us that we have sold all or a portion of our business and that we have joined forces with other platinum interests, we take this means of advising our customers, friends and the trade in general that no change of any description has taken place in our concern, nor are we in any combination whatever, and that we continue to give all that favor us with their patronage our very best effort in filling all orders entrusted to us, with extreme care and accuracy, supplying the best quality at the lowest possible price."

THE Crocker-Wheeler Co. of Ampere, N. J., has just issued a new bulletin, No. 18, describing the electrical equipment of the Joseph Dixon Crucible Co. of Jersey City. This company, which formerly operated four steam plants, has now substituted for them one electric power plant. A 100 K. W. generator and 24 motors, all of Crocker-Wheeler manufacture, have been installed. During January the company shipped electrical machinery as follows: To the De Lamar Copper Ref. Co., Carteret, N. J., one 520 K. W., one 100 K. W., one 50 K. W. generators; Iron City Engr. Co., Uniontown, Pa., four 100 K. W. generators; Anglo-American Prov. Co., Chicago, Ill., seven motors, ranging from 10 to 75 H. P.; Pennsylvania Steel Casting Co., Chester, Pa., one 350 K. W. generator; Quintard Iron Works, New York City, one 65 K. W. generator; Marine Eng. & Mach. Co., Harrison, N. J., two 50 K. W. generators, one 60 H. P. and two 35 H. P. motors; U. S. Elec. Ltg. Co., Washington, D. C,, one 90 K. W. generator, one 130 H. P. motor; National Tube Co., Pittsburg, Pa., one 110 K. W. generator; Niles Tool Works, Hannihal, Ohio, a consignment of motors; Erie Rapid Transit Ry., Harbor Creek, Pa., one 200 K. W. generator; L. S. & M. S. Rwy. Shops, Collinwood, Ohio, one 400 K. W. generator, one 75 K. W. generator; Lehigh University, South Bethlehem, Pa., one 30 K. W. generator; American Car & Foundry Co., Madison, Ill., one 110 K. W. generator; Armour Fertilizer Works, Atlanta, Ga , one 150 K. W. generator, two 50 H. P. and one 90 H. P. motors; Park Steel Co., Pittsburg, Pa , one 200 K. W. generator; J. K. Farley Mfg. Co , Chicago, Ill., one 150 K. W. generator; Ft. Hill Chemical Co., Rumford Falls, Me., four 140 K. W. generators.

Catalogues Received.

The Allis-Chalmers Co. have issued Catalogue No. 24, seventh edition, on Riedler pumps. It is strictly up to date and an engineer's handhook on the subject, which is treated comprehensively and completely. The portions relating data of operation of these pumps with compressed air are specially interesting. The same company has also issued Catalogue No. 46, fifth edition, on Riedler compressors and blowing engines. Like the other catalogue referred to ahove, this one is technically all that an engineer could ask in the completeness of its information on the subject and the simplicity of its method of statement. Both catalogues are excellent examples of high-class printing and illustrating. These catalogues can he ohtained on request being made to the Allis-Chalmers Co., Chicago, Ill.

Recently Declared Mining Dividends.

	Payahle.
Silver King M. Co , Utah, monthly, 66⅔ cents per share, $100,000	Feb. 10
Yankee Con. M. Co., Utah, No. 2, 5 cents per share	Mar. 2
May Day M. Co., Utah, 1 cent per share	Feb. 20

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MINING AND SCIENTIFIC PRESS.

Whole No. 2170.—VOLUME LXXXIV. Number 8. SAN FRANCISCO, SATURDAY, FEBRUARY 22, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

San Francisco and Metallurgical Industries.

The tendency to the concentration and development of the metallurgical industries in the seaport cities of the Atlantic coast and the Great Lakes, as compared with the inland cities where they had their inception, is manifesting itself on the Pacific coast. During the last two or three years there has been a rapid growth of the number and magnitude of such establishments both on the shores of Puget sound and at San Francisco, Cal. The latter is particularly notable in that it has not been anticipated nor has it in any way discounted the future. In this respect the growth is comparable with the growth of the same metallurgical industries around New York. At first thought they would seem to belong where the mines are rather than at points so distant from them, but the cheapness and facilities for assembling raw materials and distributing finished commodities are so superior at the seaport cities, that the industrial movement can be considered the natural operation of an economic law.

San Francisco has so long been considered purely a commercial city that the idea that it can become by the force of its inherent advantages a great metallurgical center as well may seem surprising. The fact is, however, that San Francisco, to a remarkable and exceptional degree, possesses those determining advantages which will ultimately give to its metallurgical industries the supremacy the city now has in commerce.

Mack Con. Gold Mine, Big Oak Flat, Tuolumne County, Cal.—(See Page 104.)

Its position as an assembling point for the raw materials of a metallurgical industry leaves nothing to be desired. It is very much nearer to the mines than any of the Atlantic coast cities, and with the completion of an interoceanic canal it will be equally near to all of the consuming markets of commodities. The canal will restore natural lines of movement to the assembling of raw materials and the distribution of commodities manufactured from them. The one will go outward to the nearest seacoast assembling point, the other inland from the nearest coast port. San Francisco, on the Pacific coast, will, just as has New York on the Atlantic coast, become the principal point of assembling and distribution.

San Francisco bay and its extensions, San Pablo and Suisun bays, provide on their shore lines probably a greater linear extent of deep water sea frontage, and back door railroad facilities already created, than any seaport in the world. Much of the shore line of San Francisco bay proper south of San Francisco and Oakland is bounded by too wide reaches of shallow water to be immediately available for use. North of these cities on both shores, the entire south shore of San Pablo and Suisun bays and both shores of Carquinez straits, connecting the two last named bays, offer ideal sites for metallurgical plants. The aggregate of frontage is not far from 100 miles.

This continuous shore stretch from Oakland to about Antioch may all be regarded as immediately available. It is all bordered by a channel of deep water, nowhere requiring very long piers to reach it from the shore. Two lines of transcontinental railroad run along it, so that rail and ship are close together. The facilities for the cheap assembling of cheap fuel are already partially completed and their practicability proven. The petroleum-carrying pipe line from the San Joaquin valley will give this district the cheapest fuel supply of any great seaport city in the world. Nor, in considering the future, need the cheapness, determined by the cost of the pipe line transportation from the developed San Joaquin oil districts, be considered the limit. The writer considers reasonable the prediction that petroleum fields will ultimately be developed so near by the fuel-consuming industries on this shore line that the latter will be commercially supplied at charges not exceeding in equivalent fuel value a rate of $1 a ton for bituminous coal.

One electrical transmission line already traverses this stretch of shore line. The Bay Counties Power Co. have developed a small fraction of the possible water power of Yuba river, one of the Sierra Nevada mountain streams, and are commercially utilizing more than 10,000 kilowatts (electrical horse power) in the bay shore region under consideration. The distance of the farthest transmission, 214 miles, is a demonstration of practicability of electrical transmission of the water power of all the Sierra Nevada streams within the limit of that distance at least. It makes commercially available the water powers of three forks of the Feather river, the three forks of the American river, the Mokelumne, Stanislaus, Tuolumne and Merced rivers. While the last four named are already largely utilized locally, there is an aggregate surplus that, added to what can be developed and made available from the Feather, Yuba and American rivers, will make an aggregate of between 250,000 H. P. and 300,000 H. P. The cheapness with which this water power, electrically developed and transmitted, can be laid down on the switchboards of industrial establishments on this stretch of deep water seaport shore line will seem astounding to those not familiar with what has been accomplished in water power development and transmission in California. From the branches of the American river alone more than 50,000 kilowatts can be so delivered at less than four-tenths of a cent a kilowatt hour, or not more than $25 per twenty-four hour horse power per annum.

The importance of this large available supply of cheap electrical power is of equal importance with the even larger available supply of cheap petroleum fuel. Electro-metallurgical industries are continually being developed and the general industrial tendency is to the substitution of electricity in place of fuel wherever practicable and economical. A list of the electro-metallurgical and electro-chemical processes now in every day commercial use would easily fill a page of this journal.

Great industrial changes have heretofore accomplished themselves on the Atlantic coast without making similar changes on the Pacific coast. The shifting of the centers of metallurgical industry from inland to seaport cities, the great industrial movement going on in the present time at the East is, unlike preceding changes, making a similar change here. To realize this it is only necessary to compare the industrial establishments existing and projected on this line of bay shore three years ago with those existing and projected now. The increase is all out of proportion to the gains of equal but preceding periods of time.

What is now, is only the beginning. The ultimate development here indicated is inevitable. It is coming rapidly. The foundation for it has been prepared in the assembling at one point of the conditions which so united make a commercial foundation for a great center of metallurgical industry. Here at San Francisco is the established commercial seaport center of the Pacific coast, a great linear extent of deep-water frontage backed by constructed railroad lines, the cheapest fuel supply of any great seaport in the world, the cheapest electrical power supply of any seaport city in the world, and ideal climatic conditions. The one factor at the moment short in quantity is a fresh water supply. Present local supplies cannot be much expanded, but the nearest of the Sierra streams, the several forks of the American river, after utilization for power development, may be a second time utilized to provide supply of pure water for future requirements.

The Treatment of Clay Slimes by the Cyanide Process and Agitation.*

NUMBER II.

By E. A. H. TAYS and F. A. SCHIERTZ.

THE PROCESS.—As the slimes, for the most part, presented a stiff hank of clay from 4 to 11 feet deep, they could not he shoveled directly into the cars, hut first had to he sliced off in very thin slices, cut up as fine as possible and mixed with as much of the sand slimes as could he had at hand, after which the material was shoveled into half-ton cars and trammed to the scales. In order to keep it as nearly uniform in character as possihle, it was taken from four different parts of the dump at once.

At the scales a sample was taken from each car hy running a half round, grooved sampler, 1 inch in diameter and 5 feet long, diagonally through the load from one end. These samples were put into a covered tin can and amounted, for the 100 or 116 cars treated daily, to hetween 55 and 60 pounds. This total was dried and the moisture was calculated hefore assaying. The moisture usually ran hetween 18% and 24%, the latter directly after a heavy rain, the former even in the dryest season.

From the scales the cars were trammed ahout 60 feet to the elevator pit, under the tank floor, where they were dumped, and thence raised to the top of the building, at the rate of ahout a ton in five minutes, hy a helt elevator set at an angle of ahout 60°. The elevator cups discharged into a sheet iron hox trough 4 feet long, 1 foot wide on bottom, 2 feet high at the elevator end, and 1 foot at the discharge end. Here the slimes were met hy two streams of solution, discharged vertically downward through a 1-inch pipe at the upper end of the trough. The main solution pipe was 2 inches in diameter, and the solution was pumped up from the lower solution tanks and discharged under pressure. At first one jet was discharged vertically and the other horizontally against the slimes as they fell into the receiving hox; hut we found the two vertical streams to give the hest results.

From the receiving or mixing trough the mixed slimes and solution were run into the agitators by means of three V-shaped launders made of 1-inch hoards, 12 inches wide. These launders had a fall of 1 foot in 5, and each fed two agitators, the material conveyed heing delivered to the agitators in the ratio of 1 part of slimes to 1.5 of solution.

SOLUTION.—The solution was made up in the two sump tanks, 20 feet in diameter and 5 feet high, set up in a pit at a level lower than the zinc hoxes and 15 feet lower than the agitator floor. In our tests solutions were used containing from 0.10% to 0.30% cyanide. All gave good results, hut showed a consumption of cyanide of from 7 to 8 pounds per ton. This had heen the case also when the sands were treated, and in the original experiments made by Mr. Mills it was found that, if the cyanide process were employed, the chemicals alone would cost ahout $3.50 gold per ton. In our experiments, at first we found that titrations indicated hut a slight consumption of cyanide, although the assays showed a good extraction; hut this was due to the addition of lime to the charge at the start. Afterwards, when lime was added at the heginning of the last hour's agitation, we noticed that the titration made after such addition showed from 0.02% to 0.08% higher than the titration made just hefore the additon of lime.

For awhile, after heginning to treat the slimes, we used a standard strength of 0.20% KCy with good results, hut finally dropped to 0.15%, which gave us the hest general results, involving a steady consumption of ahout 7 pounds of cyanide to the ton of slimes treated. After passing 0.20% the consumption of cyanide increased and the extraction of gold decreased. A 0.25% solution, used for twenty days on the same general character of slimes, showed a consumption of 8.75 pounds of cyanide per ton and an extraction of hut 74.98% of the gold and silver, while the 0.15% solution used in the succeeding month showed a consumption of 6.21 pounds of cyanide, with an extraction of 78.56% of the gold and silver. The value of heads in these cases were $13.34 and $13.59, respectively.

Analyses of the solution showed that it carried the metals and minerals shown helow, and in the proportions given.

No. I represents the solution as drawn off at the heginning of the decantation. No. II is from the discharge of zinc hoxes when No. I was supposed to he running through.

	I. Grams Per Metric Ton.	II. Grams Per Metric Ton.
Cu	422.9	293.2
Fe	Nil	Nil
Al	32.5	34.8
Zn	209.5	120.5
Ca	458.0	384.8
Insoluble residue	38.5	38.0
Au	4.82	0.03
Ag	6.50	0.08

This solution had heen in use for ahout ten months.

AGITATION.—As already remarked, the old tanks, 20 feet in diameter hy 5 feet deep, were utilized for this purpose hy introducing the machinery of an ordinary settler, modified to suit the use to which they were to he put. The inside cone stood 4.6 feet from the floor of the tank and was holted to a ¾-inch plate, 3 feet in diameter. This, in turn, was bolted to the hottom of the tank, which was 3 inches thick.

On top of this cone sat a muller with four 9-foot arms, which were set 7 inches ahove the hottom of the tank, when the muller was down. To each of these arms were holted, at an angle of 30°, three wooden shoes, 6x8x36 inches in size. The outside and inside shoes had a 1-inch strip nailed to the bottom, while the center shoe was left 1 inch higher, since we found that stray rocks, gravel, etc., gathered there, and in this way, not heing caught hy the arms as they revolved, did little damage. The mullers were arranged so that they could he raised 3 feet, and, after we got to running regularly, they made nine revolutions per minute. At first we had them make fourteen revolutions, hut soon found that speed to he too great, as it caused the charge to foam excessively, even with 3-inch wings.

At equal intervals were placed four wings, 3 inches wide, 2 inches thick and 4.5 feet high. During the first experiments these wings consisted of 2-inch plank, 12 inches wide and 5 feet high, hinged to the inside of the tank. To this was holted a 4-foot piece of 2-inch plank, horizontally, at a height that would just clear the top of the muller arms when down and in motion. This was set at any angle desired, and, when the muller was to he raised, could he turned in against the side, out of the way. But it was found to give too much resistance to the current, producing much foam. The horizontal arm was taken off and the vertical, movahle wing used alone. This was gradually swung hack against the side of the tank until the edge alone offered resistance to the current. This, although hut 3 inches out, was ample, so, after that, strips 3 inches wide were screwed against the sides and used up to the end of the run.

To prove that these wings were necessary, we had one charge run without them. The outer surface of the charge rose ahout 12 inches higher than the center, and the general surface was smooth, whereas with the 3-inch wings the charge was level clear across, while in motion, and the whole surface was kept in constant ehullition, the currents starting from each wing making chords suhtending more than one-third of the circumference. That agitation was perfect was proved hy numerous samples taken from the surface of a charge while in motion, and from the same while discharging from the hottom.

THE CHARGE.—The slimes and solution as mixed (1 : 1.5) were delivered to the agitators in motion, ahout 5 tons of the clear solution having heen previously charged, though this was not absolutely necessary, as the amount of solution necessary to make up the charge could he, and often was, added at the last. The aim, however, was to have the charge ahout as it should be at the time the last slimes were run in.

As a rule, charging occupied ahout fifty minutes, and there were charged to each agitator about eighteen carloads, containing in all about 11 metric tons of moist slimes and 28.5 tons of solution, or a total of ahout 39.5 tons. This would bring the charge to within 8 inches of the top of the agitator.

The total charge thus consisted of 1 slimes to 2.6 solution, hut since, as a rule, the slimes contained 18% of moisture, the charge was really 1 slimes (dry) to 3.4 solution. This proportion was observed for slimes containing more than 75% of clay. Where there was more sand we got an excellent settling with charges running 1 slimes (dry) to 2.6 solution.

The charge was agitated five hours from the time when charging hegan. This period was found to he ample, as the following tahles of extraction will show:

TABLE I.—RATE OF EXTRACTION WITH 0.20% KCY SOLUTION.

(Charge, 10 tons slimes, 10 tons solution. Samples every two hours from surface. Test No. 2, April 15, 1900.)

Hours	Gold—Grams per Ton	Silver—Grams per Ton	REMARKS.
0	22.20	37.80	
*1.30	12.00	20.00	* Finished charging.
3.30	7.20	15.20	
5.30	6.80	14.20	
7.30	6.20	12.80	
9.30	5.80	12.20	
11.30	5.60	11.20	
13.30	5.40	10.60	
15.30	5.00	9.60	
17.30	5.60	12.40	
19.30	6.00	10.80	
21.30	5.60	11.20	
23.30	5.40	11.00	

Tailings. Assays per Ton.	Gold. Grams.	Silver. Grams.
First tails discharged..	5.20	12.00
Last tails discharged..	5.00	11.00
Average	5.10	11.50

Extraction: Gold 77%, silver 69.57%.

It will be noted that 45.94% of the gold and 47.1% of the silver had heen extracted hy the time the charge was run into the tank—one hour and thirty minutes—and two hours later 67% of the gold and 60% of the silver had heen extracted.

TABLE II.—RATE OF EXTRACTION WITH A 0.10% KCY SOLUTION.

(Charge, 10 tons slimes—60% clay and 40% sand-clay slimes, 20 tons solution. Samples every two hours from surface. Test No. 3, April 18, 1900.)

Hours	Gold—Grams per Ton	Silver—Grams per Ton	REMARKS.
0	21.20	39.20	* Finished charging.
*1.20	7.20	19.20	Maximum extraction is evidently
3.20	6.00	14.40	reached. Tails assayed 4.60 grams
5.20	6.40	14.60	gold and 10.40 grams silver per ton.
7.20	6.00	12.00	Extraction: Gold 78.3%, silver
9.20	6.00	10.40	73.72%.

It will he noted here, also, that hy the time the charge had heen run in—one hour and twenty minutes—66% of the gold and 53.5% of the silver had heen extracted. This was undouhtedly effected hy running at high speed through the troughs from where the slimes and solution mix, to the agitator, and hy the agitation during churning.

TABLE III.—RATE OF EXTRACTION WITH A 0.30% KCY SOLUTION.

(Charge, 10 tons clay slimes, 20 tons solution. Samples every two hours from surface. Test No. 4, April 20, 1900.)

Hours	Gold—Grams per Ton	Silver—Grams per Ton	REMARKS.
0	21.00	28.20	
*1.50	5.20	14.80	* Finished charging.
3.50	3.50	8.60	Tails assayed 4.20 grams gold and
5.50	4.40	10.80	9.20 grams silver per ton.
7.50	5.20	11.60	Extraction: Gold 84.4%, silver
9.50	4.00	9.20	67.4%.

This test shows that the extraction had virtually ceased in four hours.

TABLE IV.—RATE OF EXTRACTION WITH A 0 22% KCY SOLUTION.

(Charge, 5 tons clay slimes, 15 tons solution. Test No. 5, April 21, 1900.)

Hours	Gold—Grams per Ton	Silver—Grams per Ton	REMARKS.
0	22.00	38.00	* Finished charging.
*0.45	6.20	17.00	Discharged tails assayed 3.80 grams
2.45	5.00	13.10	gold and 8.20 grams silver per ton.
4.45	3.60	9.80	Extraction: Gold 82.73%, silver
6.00	4.00	11.20	78.42%.

This charge was agitated but seven hours from the start. In forty-five minutes the charge was in, and samples taken showed that 71.81% of the gold and 55.26% of the silver had gone into solution. Extraction had virtually ceased in four and three-quarter hours from the start. In this test two samples were taken of the tails at the same time, one to he washed and the other to he dried as it was.

The washed sample assayed Au 3.80 grams, Ag 8.20 grams.

The unwashed sample assayed Au 6 grams, Ag 11.60 grams.

This gave an actual percentage extraction of 82.73 Au and 78.42 Ag, and a product ohtainable of 72.72 Au and 69.47 Ag. This would show a loss of 2.20 grams of soluble gold and 3.40 grams of soluble silver per ton. In the regular work the soluhle gold lost was about 1 to 1.5 gram per ton.

The ahove data, and others ohtained from similar tests, led us, when we hegan the regular treatment, to agitate the charges only five hours.

(TO BE CONTINUED.)

THE House Committee on Coinage, Weights and Measures has taken the testimony of leading manufacturing and business houses on the advisability of adopting the metric system of weights and measures. Among those heard were Prof. Elihu Thompson of the General Electric Co.; Henry Troemer, an extensive manufacturer; Dr. A. E. Kimmerley, consulting engineer of Philadelphia, and Prof. W. W. Croshy of the Lowell School of Technology. The sentiment was entirely favorahle to the adoption of the metric system.

*Trans. American Institute Mining Engineers, Mexican meeting, November, 1901.

Stateline Mining District, Iron County, Utah.

Written for the MINING AND SCIENTIFIC PRESS by GRANT H. SMITH.

Stateline mining district is located in the southwestern part of Utah, in Iron county, close to the Nevada line, some of the claims extending into Nevada. The mines were discovered six years ago and many claims were located. The mines are situated 16 miles from Modena, a station on the Oregon Short Line Railroad, and are at an altitude of 7000 feet. The wagon road from the railroad is good and the mines are easy of access, lying for the most part on low, wooded hills. The climate is favorable and work may be carried on throughout the year. Wood is good and plentiful, the best nut pine being delivered for from $2.50 to $3.50 per cord, depending upon the situation of the mine. There are two small streams of water in the district, enough for milling purposes on a moderate scale. Water is being encountered in some of the deeper opened mines, notably the Johnny, and while there is no danger of water in excess the Johnny and the Margaret will probably have to pump from their shafts sufficient water for milling purposes.

The ores, with the notable exception of those from the Ophir mine, are what are generally described as free milling, carrying gold and silver associated with a small percentage of iron in several minerals, and a small percentage of manganese. The milliug, with the exception of the Ophir, which has adopted a leaching process, will require breakers, stamps, plate amalgamation, and concentration by means of tables. The cost of milling in a 20-stamp mill should be less than $1.50 per ton, and should save about 90% of the values. With some of the richer ores it may be profitable to cyanide the tailings.

The mines are found in the quartz veins in a great dike which is made up of a succession of flows and intrusions of various eruptive masses which go by the name of porphyries. This dike is a mile wide and several miles long and is highly mineralized. The main and underlying mass is a hard, iron-stained quartz-porphyry, or rhyolite, similar to the formation in which the Bodie, Cal., mines were found, and not unlike the hanging wall, at the surface, of the Comstock lode in Nevada. The other overlying and intrusive masses are of various colors, from white to gray and green, and are less siliceous and more feldspathic. The veins often carry considerable fluorspar, as at Cripple Creek, Colo., though the fluorspar is seldom gold-bearing. Black oxide of manganese is found in nearly all of the veins and occurs in greatest abundance in the ore shoots.

The country rock, which may be described as porphyry, now occupies what was probably the vent from which flowed the great sheets of andesite, trachyte, and other like eruptives, including tuffs and breccias, which cover the country to the eastward for miles. There are no sedimentary rocks in the district nor to the east of it, but a non-mineralized limestone belt lies only a few miles to the west. The range north and south is made up of eruptives. The underlying quartz-porphyry, in which most of the veins have been formed, appears to have been little eroded. In almost all cases the richest rock occurs some distance below the surface, and there is no placer gold worth mentioning in the gulches, suggesting that no extensive ore bodies have been eroded.

The main lines of fracture in the porphyry extend northerly and southerly, and nearly all of the veins in the district have been formed in north and south fissures. These veins vary from mere stringers to 30 feet in width, and upon them are located nearly all of the mines in the district, notable among them being the Utah Spur, Willowvale, Sunflower, Gold Belt, Burro, Creole and Jumbo. All of these mines seem to have considerable quantities of good ore. The north and south veins, as a rule, have good walls and are strong and continuous, the ore occurring in well-defined shoots.

The notable exception to the rule of northerly and southerly veins is the big east and west vein upon which the three principal mines of the district are located, namely, the Ophir, the Margaret and the Johnny. It is presumed that these three mines are on the same fissure, because they are nearly in line and together, because of local similarities, and because no other east and west fissure is found in the vicinity. Connection underground has not been made, however, and the croppings for hundreds of feet at times are covered with slide and wash. There is a known faulting of the vein between the Johnny and the Margaret workings, and there is probably another between the Margaret and the Ophir. This fissure, having broken across the main line of fracture, is characterized by irregular walls, particularly in the Johnny and in the Margaret, and at times in those mines by no means distinct walls, much of the ore being a replacement of country rock and gradually fading into it, like the ore deposits at Cripple Creek, Colo.

Another striking feature of the east and west vein is the presence of silver. The north and south veins, as a rule, carry but little silver, while in the east and west vein the silver values commonly equal the gold values. This is true of the Margaret, though in the Ophir, lying to the west, the silver values predominate, while in the Johnny, on the east, the gold values are in excess. The vein filling is always quartz, with more or less silicified and decomposed country rock. The main values lie in the quartz, though the walls are always more or less mineralized. At times the partly replaced country rock in the veins is very rich. In the Johnny and in the Margaret some of the richest ore is found about enclosures of country rock in the quartz.

The ore of the district may be called low grade, and must be milled on the ground. Very rich samples may be taken from almost any vein, and in a few mines there are large shoots from which some lots of ore running from $100 to $2000 per ton has been and may be sorted and shipped, but most of the higher grade ores would be milled with the other ores, owing to transportation and treatment charges. The east and west vein is somewhat irregular in width, varying from 4 to 15 feet, and the best ore occurs in fairly well-defined shoots, which seem to make at or near intersections with north and south veins. The Ophir has so far developed one very large ore shoot, about 300 feet long, from 5 to 10 feet thick, and extending from the surface to the 400-foot level. The Ophir shaft is now 500 feet deep and drifts from this point to the ore shoots are now being run. Some of this ore is very rich and several hundred tons averaging about $100 per ton have been shipped to the smelters. Another known shoot exists in Ophir ground east of the big shoot, and probably there are others, but the vein has not been explored far east of the shaft, and the croppings are in the main covered with debris. The Ophir has just completed a 100-ton mill at a cost of $100,000.

The Johnny has so far developed three large ore shoots, some small lots of ore shipped to the smelters hyinging over $2000 per ton and much of it over $200 per ton. This mine has produced about $30,000 in the past two years. The shaft is 260 feet deep and no drifting has been done below the 160-foot level. The owners are developing the mine now and will build a large mill next summer. At present they are sinking the main shaft, which is in good ore, and are drifting through a rich shoot of ore on the 100-foot level at a point 300 feet east of the shaft.

The Margaret has thus far developed but one of its known ore shoots. This shoot crops along the surface for 150 feet and is from 3 to 8 feet in width, and averages $8 per ton, though much of it will run from $12 to $15 per ton. It was cut at the 60-foot level and drifted upon east and west for 50 feet, and a full face of ore is exposed in the face of each drift, the average value, excluding the high-grade ore, being about $10 per ton. Mixed with the milling ore at this level was found considerable rich ore running from $50 to $200 per ton. Within a few weeks the same ore shoot will be opened up in the crosscut on the 150-foot level. Another ore shoot lies west of the shaft, but it is undeveloped as yet. It extends for over 300 feet on the strike of the vein and averages more than 4 feet wide. The croppings run from $1 to $20 per ton. The company is now sinking a vertical double-compartment working shaft which at the 200-foot level will interesect the east ore shoot at a point 300 feet below its apex. From this level a drift will be extended west under the west ore shoot for its entire length. The gold in the richest Margaret ore seems to occur in the form of a telluride.

Shannon Copper Co.'s Operations at Clifton, Arizona.

[STAFF CORRESPONDENCE.]

The smelting plant of the Shannon Copper Co. at Clifton, Ariz., is nearing completion and will doubtless be in operation by March, 1902. The plant is located on the slope of the hill, near the San Francisco river, and about a mile from town. There are two blast furnaces, each 44x170 inches, the two having a daily capacity of 600 tons charge. In these there is no brickwork below the level of the charge floor, each having a double row of jackets. The furnaces are built in a steel structure, 42x80 feet in size. A few feet below the discharge is a track for slag cars, the latter being hauled by an electric locomotive. Near the furnace building, and connected with it by a 6-foot blast pipe, is a 58-ton blower, with a capacity of 30,000 cubic feet of air per minute. This is direct connected to, and operated by, a 300 H. P. tandem, compound condensing engine. Blower and engine are enclosed in a 66x80-foot steel building. There is also a smaller engine to operate a generator for light and various motors. Within the adjacent steel boiler room are two Sterling water-tube boilers of 250 H. P. each. The matter of utilizing fuel oil for the boilers is being considered. The dust flue from the blast furnaces to the dust chamber is 10 feet in diameter. The latter is built of stone, is 100 feet long, 20 feet wide and 20 feet high, interior measurement. The dust, gases and fines which discharge from the furnaces enter the upper portion of this dust chamber, the bottom of which is made up of rectangular hoppers, into which the dust settles. Through the hoppers the dust is discharged periodically into cars on tracks below. From the dust chamber the fumes pass through 175 feet of horizontal arched flue to the base of the main stack. This flue is laid on the surface of the ground, is arched over by a steel frame, lathed up on the inside with expanded metal, and both the interior and exterior plastered with cement. The self-supporting steel stack is 150 feet high and 13 feet diameter. It was erected, piece by piece, riveted by compressed air, without the aid of scaffolding. The platforms for the workmen consisted of a circular staging on the inside and a traveling chair on the outside, the inner staging being suspended by chain blocks attached to uppermost course of sheets.

Smelter of Shannon Copper Co., Clifton, Arizona.

On a plane above the smelter charge floor are the twenty-three ore bins, each 20x20x16 feet, with a chute from each. Above the bins is the railroad track, the ore being dumped from the cars to bins automatically.

The water supply is pumped from wells near the river to tanks above the plant. The equipment includes a condenser and two Barnard cooling towers for cooling the circulating water.

Manager P. Wiseman states that to begin with the plant will turn out a black copper product, but that later on a concentrating plant will be erected and two or three stands of converters put in, and the product will then a bessemerized copper. The ores from the Shannon group comprise oxides, carbonates and sulphides. On the operating force M. J. Welch is construction engineer, P. O. Wels smelter Supt.

The mine of the Shannon Copper Co. is about 8 miles northwest from Clifton, overlooking Chase

gulch, and half a mile from Metcalf. A surface tram line, built on an incline of 36°, 1500 feet long and double tracked, is operating between the bottom of Chase gulch and the main tunnel level of the mine. At the foot of this incline are six ore bins with chutes for loading into cars. At the upper terminus are six similar bins which receive the various grades of ore from the mine. The cars on the incline operate by gravity, the 1¼-inch cable winding on a double-drum reel, at upper terminus. These drums are 13 feet diameter, each 5 feet 8 inches wide, and having a 14-inch brake band. This gravity operated hoist runs an air compressor, the latter serving as an auxiliary brake, so as to absolutely control the motion of the loads on the line. The main double track mine tunnel crosscuts to the ore bodies in Shannon hill. It is 715 feet long and cuts about 300 feet below the apex. It is 7x8 feet, was driven in seventy-eight days by hand drilling at a cost of $5 per foot. This tunnel connects with numerous other tunnels, drifts and levels from different directions; and also with workings above it through chutes. Most of the ore blocked out is above this main level and will be taken out through the latter. The ores of the upper levels comprise carbonates and oxides, and those at greater depths are sulphides. At the mine Wm. T. Chino is Supt. and D. G. Davies mechanical engineer.

Clifton, Ariz., Jan. 20.

The Value of Ores in Mexico.*

By N. H. EMMONS.

In the United States the value of gold and silver ores is everywhere reckoned in ounces troy of the metal per "short ton" (2000 pounds avoird.) of the ore. In the case of silver, which fluctuates in market value, the New York quotation on a given day must be known, in order to determine the gross value of an ore at that date.

In Mexico the assay is reported in kilograms of silver or grams of gold per metric ton. As everyone is aware, this is practically a percentage system, 1 kg. of silver per metric ton (1000 kg.) being 0.1%, and 1 gram of gold per metric ton, 0.0001%. The notation is simple and convenient for both assayer and miner.

The Mexican Government purchases at an unvarying price for silver, payable in silver, and at a fixed price for gold, payable in gold if the seller insists, but preferably in silver at about the rate of exchange between United States gold coin and Mexican silver coin. The value of silver is $40.915 per kilogram in Mexican silver dollars. That of gold is $675.416 per kilogram in gold coin. The mints do not, as a rule, issue gold dollars, as the Government keeps them to pay the interest on the national debt. Almost all bullion containing a considerable percentage of gold is shipped to foreign countries, principally the United States, to be refined.

The Mexican mint receives for refining and coining no bullion which is not at least .950 fine in gold and silver, separately or combined. For the fine silver it pays $40.915 Mexican per kilo, less 2% coinage charge and 3% stamp tax. For assaying each bar, not more than 35 kg. in weight, $2.50 Mexican is charged, and for separating gold from silver, $0.75 per kg. of bullion. Gold, if over $\frac{1}{1000}$ is present, is paid for at $675.416 gold per kg.; but payment is made in silver dollars at about ten points below the current quotation of exchange. Finally, the State tax, about to be mentioned, is collected upon bullion, unless it has been previously paid on the ore.

Government charges practically unknown in the United States are the taxes on ores of silver or gold, paid both to the Federal and to the State governments throughout the Republic of Mexico. These taxes, being laid upon gross product without reference to profit, are likely to be so severe that in many parts of the Republic it has been the custom not to insist upon the payment of the full State tax. The Federal tax, however, known as the mining tax, is collected upon all the gold and silver produced in the country—either at the mints upon the bullion presented for coinage, or at the points of export upon ores or bullion shipped to other countries.

The State "extraction tax" is levied on ores mined and is supposed to be collected before the ores leave the mine yard, or "patio." This has been found, for many evident reasons, impracticable, and it has come to be the custom to collect the tax as the ores leave the mining camp, or, if they are treated in the camp, then as the product is shipped away. The Government may accept the sampling and assays of the owners, or an official may be sent to superintend the sampling and take a special sample for Government assay. The manifest of the shipper states the number of metric tons shipped and of kilograms of silver and gold per ton. The collector calculates the silver value of the shipment at $40.915 per kg. of silver, and collects 2% of that value for the State, and also, according to the Federal statute, 30% of the State tax, or 0.6% of the value, as the Federal tax. The total (2.6% on $40.915) is a direct tax on the silver in the ore of $1.0638 per kilogram, or (1 kg. being 32.15 ounces troy) about 3.3 cents per ounce.

If the ore is smelted in Mexico the smelter pays the tax; if it is exported, it must be accompanied with a consular invoice, and sampled and assayed at the border by the Mexican Government. In this case the mintage tax—that is, the charge which would have been made if the bullion had been sent to the Mexican mint—is also collected. For bullion, matte or other metallurgical product this tax of 5% is collected upon the full assay value of the metal contained. For ores it is collected upon 90%, and is, therefore, 4.5% of the assay value.

Finally, if ore is sold to any purchaser in Mexico, there must be a bill of sale, or "factura," on which revenue stamps to the amount of 3 cents for every $5 or fraction thereof are affixed and cancelled by the seller. This stamp tax is not peculiar to sales of ore. It is required for every sale of merchandise amounting in value to $20 or more. The value here contemplated, however, is not the gross value, calculated as above described, but the net value, or the amount paid by the purchaser.

It will be seen that the taxes on ores of gold or silver mined in Mexico comprise 2.6% of gross value as State and Federal extraction tax, plus 4.5% as mintage tax, or, in all, 7.1% of the gross assay value, to which must be added the stamp tax on the factura of 0.6% on the net value.

In order to show how the value of a given ore to the miner is determined, it will be convenient to assume an example, bearing in mind that some of the conditions stated would vary with the locality. In most districts the regular gold price paid by the smelters for silver in ores is 90.5% of the New York quotations; for gold, 95% of the assay, at $19.50 per ounce; for lead, if the ore is a rich lead ore, 1 cent per pound on 90% of the contents as per assay; allowances for freight and treatment being made according to local conditions—the latter according to a regular scale for "neutral" ores, with suitable modifications for departures from that quality. We will assume $9 United States money per "short" ton for freight and treatment, and take as a basis the New York quotations of Sept. 20, 1901, which were 58.25 cents per ounce for silver and 4 cents per pound for lead. Bankers' exchange in the City of Mexico on the same date was 1.165% premium.

We assume also a neutral ore containing per metric ton 1000 grams of silver and 3.43 grams of gold (i. e., 29.167 ounces silver and 0.1 ounce gold per ton of 2000 pounds) and 20% of lead. This ore would pay the miner as follows:

The silver, at 58.25 cents per ounce, would be worth $18.728 United States currency per kilo, and would be paid for, as above stated, at 90.5% of this value, making upon the ore assumed $16.96 for silver. Gold, at $19.50 per ounce, would be worth $0.626 per gram, and 95% of 3.43 grams at this price would bring $2.04. Of the 20% of lead (200 kg. per ton) 90%, or 180 kg., would bring 1 cent per pound, (2.204 cents per kg.), or $3.97. The total for silver, gold and lead would thus be: $16.96 + $2.04 + $3.97 = $22.97 United States currency per metric ton, apart from the extraction tax and stamps on factura, freight and duties. (The purchaser, paying for only 90.5% of the silver and 95% of the gold, assumes the mintage tax.)

Deducting the assumed treatment charge of $9 per short ton, which is $9.92 per metric ton, we have as the net returns to the seller $22.97 — $9.92 = $13.05 United States currency per metric ton. But from this he must pay the extraction tax of 2.6% on the nominal value of $40.915 per kg. of silver and $675.416 per kg. of gold (reduced to silver at about 2.10 exchange), or, upon the ore here assumed to contain 1 kg. silver and 3.43 grams gold per ton, $1.18 in Mexican money, and also the stamp tax of 3 cents for each $5 Mexican money. Reducing the above return of $13.05 to Mexican money, we have ($13.05 × 2.165) $28.25, which would require 18 cents stamp tax. Consequently, the ultimate net return to the seller would be, in Mexican money, $28.25 — ($1.18 + $0.18) = $26.89.

Recalculating on the American basis of ounces per short ton, we would have as the value per short ton of the ore under consideration:

Silver: 90.5% of 29.167 ounces at 58.25 cents	$15 38
Gold: 95% of 0.1 ounce at $19.50	1 80
Lead: 90% of 400 pounds at $0.01	3 60
Total in United States money	$20 78
Less treatment charge per ton	9 00
Net value in United States money per short ton	$11 78
Or, in Mexican money, at (2.165)	25 50

From this we have to deduct the extraction tax, which is, above stated, $1.18 per metric ton (2.204 pounds avoird.), and would therefore be per "short" ton, $1.18 + 2000 ÷ 2204 = $1.07, Mexican money. And, finally, the stamp tax on the factura would be, as before, 18 cents, making total deductions of $1.25. Subtracting this amount from $25.50, we have a final net return per short ton of $24.25 Mexican or $11.20 United States currency. It will be understood, of course, that this calculation is simply a restatement of the one previously stated, and is introduced simply to facilitate comparison for those who are not accustomed to reckon by the Mexican method.

Two comparative statements will be specially interesting to American miners and sellers of ore, as showing, respectively:

1. What would be the net return in the United States for ore sold under the same conditions, i. e., with freight and treatment at $9 per ton, and lead quoted at 4 cents per pound in New York; and

2. How the value of such ore in Mexican money will be affected by an extremely high or low market price of silver.

1. Ore of the character assumed above, if mined in the United States and sold under the same conditions as to freight and treatment charges and price of lead, would return to the miner 95% of the silver value, or $16.14, instead of $15.38; 100% of the gold value at $19.50 per ounce, or $1.95, instead of $1.80; and 90% of the lead value at full New York quotations of 4 cents per pound, or $14.40, instead of $3.60, making a total of $32.49, instead of $20.78, per short ton. Deducting $9 for freight and treatment, we have $23.49 United States ($50.86 Mexican) as against $11.20 to the Mexican miner of the same ore, situated at an equal distance from the smelter.

2. The effect of fluctuation in the price of silver upon the value of Mexican ores may be illustrated by assuming that silver is quoted in New York at 40 cents per ounce, instead of 58.25 cents, as in the above examples. In that case, exchange will be forced up to $3.18. We would then have, per ton of 2000 pounds, 95% of 29.167 ounces, at 40 cents, or $10.56, instead of $15.38 for the silver, and the other items would remain unaltered, so that the total would be $15.96, or, after deducting $9 as before, $6.96 United States, which, however, by reason of the higher rate of exchange, would be $22.13 Mexican, as against $25.50 Mexican with silver at 58¼ cents. It will be seen that the increased value in Mexican currency of the gold and lead, due to the lower price of silver and the consequent rise in exchange, greatly diminishes the loss of silver in the ore.

To elucidate still further the bearings of this curiously balanced and complicated set of constant and variable factors upon the Mexican mining industry, let us take as an example a reduction works, located at the mine, and so situated with regard to ores, fluxes, etc., as to be able to produce bullion high enough in silver to be sold directly to the Mexican mint. In other words, the standard value of $40.915 per kg. will be received for the silver, and in lieu of $9.92 United States, charged for freight and treatment, the charge for treatment will be $15 Mexican per metric ton. Omitting, for simplicity, gold and lead, and considering the ore to carry silver only, the miner will receive per metric ton, on ore containing 1000 grams of silver, $40.915 — $15 = $25.81 Mexican, less the taxes and duties above set forth. This return is independent of the price of silver. If silver drops to 40 cents, as above supposed, he will receive $25.91, Mexican, less the same taxes and duties as before—only the exchange value of this sum will be smaller, by reason of the higher rate caused by the fall in silver. But this smaller exchange value does not affect his expenses for labor and power, because wages, fuel and domestic supplies are paid for in Mexican money, without regard to temporary fluctuations in the market price of silver. It is only in the purchase of imported supplies for mining and milling, or machinery, etc., needed for repairs or new constructions, that the difference is felt. Of course, any dividends that might be paid, though they would be no smaller in Mexican money, would be reduced in value to foreign owners by the higher rate of exchange.

Lead has very little value for the Mexican miner, since the price paid for it by smelters is practically nothing, compared to what is paid in the United States.

Copper and gold ores pay more profit to the Mexican miner, whether calculated in United States or in Mexican money, the lower the price of silver and the higher the rate of exchange.

Profits (estimated in Mexican money) from silver ores, if they can be treated locally, at expense chiefly payable in Mexican money, are affected only by the amount of imported supplies required for their treatment. If they go to smelters which make their charges in United States money, the returns will depend on the price of silver and the rate of exchange.

As a general conclusion, it may be said that, by reason of the peculiar conditions explained and discussed above, the mines of Mexico are less dependent upon the market price of silver than those of the United States.

* Trans. American Institute Mining Engineers, Mexican meeting, November, 1901.

PROGRESS on the Simplon tunnel for December, 1901, is reported as follows: The advance of the two main headings aggregated 640 feet, practically all of this being in the north heading. The total advance up to the end of 1901 is 14,500 feet in the north heading and 20,800 feet in the south heading—a total of 35,300 feet. The number of men employed on the tunnel during December was, on the average, 3220, of whom 2296 worked in the tunnel and 924 outside. The north heading was in slaty gneiss rock throughout the month, while the south heading was in a disintegrated calcareous mica schist, requiring difficult timbering and hand drilling. The water flowing from the portals measured at the north end 27 gallons per second and at the south end 230 gallons per second.

THE House Committee on Coinage has made a favorable report on the bill appropriating $200,000 for establishing a branch mint at Tacoma, Wash.

What to do When the Gas Engine Stops.

By Albert Stritmatter.

The question of the exhaust from a gas engine is one which should he considered very carefully in arranging the installation of the engine. As the hurned gases are not pleasant, the exhaust should not he discharged under windows, etc. The pipe will of necessity be very hot and should not he placed in contact with wood or other inflammahle materials. A very nice, although most too expensive a method to he adpoted in a great many cases, is to use ashestos packing or covering around the pipe when it must he run close to woodwork. A great deal of the trouhle from gas and gasoline engines is due to the exhaust pipe not heing arranged correctly. It should he as short as possible and with the smallest numher of hends that are necessary. Where it is impossihle to avoid having a very long pipe, an exhaust pot must he placed close to the engine. Too long a pipe or one with too many hends in it will cause a strong back pressure of hurned gases into the cylinder and this will foul the cylinder and incoming charges to such an extent that they will not ignite, or if they do will give only a weak explosion. If an exhaust pipe is led into a chimney, it should he carried up to the top of the huilding, as the exhaust gases may collect in the chimney and cause damage. Where the pipe is led simply into the chimney, it frequently occurs that through improper mixtures or failure of the igniter, etc., an unexploded charge of fuel will collect in the chimney and be exploded by the flame from the next charge which is exploded and exhausted, which results in an explosion, in the chimney doing considerahle damage. These explosions, when they occur in an exhaust pipe, do no harm except possihly to break some of the muffler plates. They may occur with any make of engine and result from improper mixture, failure to ignite, back pressure from clogged up exhaust ports, valves or muffler, or from too long an exhaust pipe or one with too many hends as explained before.

The exhaust valve and exhaust passages of a gas engine have heen aptly likened to the human intestines or to the sewers of a large city. Therefore we understand that the exhaust system of a gas engine is as important in the successful operation of the engine as are the mixtures, compression and ignition. We have, in the first article, investigated these three operations of the engine and, if we still have not located the difficulty, will look first at our exhaust muffler to see if the perforated plates are filled up with hurned grease, etc. If they are, we will take them off and put them into a fire, thus cleaning them thoroughly, and will then replace them. If they have heen clogged up for any length of time, the prohahlities are that the auxiliary exhaust port, if there is one, and the exhaust valve are likewise clogged with the hurned grease and smoke, and they should he cleaned thorougly also. We are, of course, assuming all along that our engine is properly designed. If, however, we have an engine with too small an exhaust valve, we are sure to have trouhle with prohahly no way in which to remedy. The same will apply to the inlet valves.

One trouble caused from the exhaust pipe is that when the engine is running the pipe gets exceedingly hot and on cooling frequently condenses moisture inside of it. As soon as an attempt is made to start it again, the moisture is likely to he sucked into the cylinder and cause difficulty in starting. The exhaust pipe should, if possible, he placed so that the water cannot run hack close to engine, but if this trouble is encountered frequently a drain cock should he placed at the lowest point in the pipe to enahle the operator to drain off this condensed moisture.

The end of the exhaust pipe must be so located that sand or dirt and water cannot be sucked back into the cylinder and cut it up. This is one objection to placing an exhaust pipe in a chimney without carrying it to the top of the building.

Finally, if we have not yet located the difficulty with our engine, we must look at the various points of adjustment, lubrication, etc. Many engine operators have a wrong idea as to the water cooling system. They think that the water coming from the engine must be very cool. This is not the case for the water circulating system is intended to carry off only the surplus heat. Experiments show that best fuel consuption is obtained when the water leaving the cylinder jacket is not below 160° to 180° or 190°, F., and so long as the water is not actually hoiling no damage is likely to be done to the engine, although 175° or 180° is about the correct temperature. Of course at this heat one could not keep his hand in the water. Where a natural circulating system is used, care must be taken that the overflow pipe is completely submerged. If it is not, air will get into it and stop the circulation of water. This overflow pipe also should be so placed that there is no point in it lower than another point between it and the engine. The object is to have a continually increasing height from the engine to the tank, so that the hot water will have no difficulty in returning to the water tank. To obtain the full benefit of a water tank the bottom of it should be set on a level with the engine cylinder. Frequently if the water used contains much lime etc., there will be considerable deposit in the water jacket spaces so that once or twice a year this must he cleaned out. We must see that the cylinder is properly luhricated, not too much or too little. If too little lubricating oil is given, the piston will expand and stick in the cylinder. If too much is fed, the surplus will stick to the piston rings, etc., as well as fill up the exhaust port and muffler. We must see that the piston end of the connecting rod is properly adjusted to take up wear and yet it must not he too tight. If it is the piston will jump up and down in the cylinder and cause considerable wear in a very short time. The crankshaft end of the connecting rod must likewise be properly attended to, in order to keep the wrist from hecoming too hot, prevent undue wear, etc. The main hearings must be luhricated properly, as well as the other hearings, etc. The governor must he kept in proper adjustment and lubrication for on it depends the steadiness of the speed. Once in a while a governor is so designed that if anything gets out of adjustment or hreaks, the engine runs away. This is the wrong principle, as it should he so designed that if anything goes wrong the engine will stop. Engines frequently do stop without any apparent cause, but really hecause something in the governor is out of adjustment. Perhaps one of the hevel gears may get loose, or something of that kind.

Mention has already heen made of the fact that water condenses in the exhaust pipe on cooling. Frequently water will condense inside the cylinder and cause trouhle in starting. In cold weather this water may run around the valve seats and freeze them tight during the night, causing the valves to stick when starting. This sometimes results in a part of the valve cage or the mechanism operating the valve heing hroken. The valve stems should he tapped lightly in order to loosen the valves from the seats hefore attempting to start.

Often, where a water pump is attached to the engine, it may freeze slightly during the night and may hreak if not warmed up with a torch hefore attempting to run.

As was referred to while discussing the suhject of fuel supply, the operator should study and understand thoroughly the device on his engine for carrying the gasoline from the pump into the cylinder proper. These devices cause a great deal of trouhle from the fact that operators do not understand them and keep them in adjustment or clean. Generally speaking, these devices are the most delicate ahout the engine with the exception of the igniter.

In great many cases they are very complicated, in which case they will require all the more study and attention. But even with the simplest devices care must he taken to keep dirt or other substances out of the apparatus. Many times a small string of waste will get caught in it while the operator is wiping up the engine and this will frequently partially or entirely stop the supply of gasoline.

Engines which have packing joints sometimes cause trouhle from leaks in the packing. The hest material to use for such joints is asbestos board, one-sixteenth of an inch thick, cut to shape and soaked in hoiled linseed oil. If in a hurry and unahle to secure the linseed oil, soap well the ashestos hoard. This will do nearly as well as if soaked in oil. On putting them on, if the flange or head is placed on by several holts, do not draw one bolt clear up hefore straightening the others. Draw up one holt fairly tight and then another, and so on, tightening each one a little in succession. This will give an even pressure all around prevent springing the parts. The same process should he followed in screwing in valve cages, where they are secured in this manner.—American Manufacturer.

Commonwealth Mill and Mine.

[STAFF CORRESPONDENCE.]

The Commonwealth mill at Pearce, Ariz., is equipped with eighty stamps, 950 pounds each, which make 102 drops per minute. They crush ahout 210 tons per twenty-four hours, discharging through a 35-mesh screen. Before going to the stamps the ore is broken by a Blake crusher and a set of roughing rolls. There is no battery nor plate amalgamation, the material passing from stamps to settling tanks, from which the water and fine slimes overflow and pass to other settlers. The pulp from settlers goes out through side gates into the amalgamating pans, containing the quicksilver, bluestone, copperas, salt and sulphuric acid, two pounds to the ton of the last being used. The pan agitators make about seventy-one revolutions per minute. After five hours of agitating in the pans the pulp is drawn out into round settlers, in which the agitation is slower.

The ores are a hard and decomposed quartz and talc, carrying chloride of silver and free gold, with some argentite in places. As depth is gained in the mine, the silver is said to decrease and the gold to increase. The main working shaft is on an incline and sinks to a depth of 475 feet, striking water level at 425 feet. The ledge is 40 feet wide in many places, there being some stopes of that width and 200 feet long.

The power for mill engines, hoisting engines and dynamo is supplied by steam from seven water-tube boilers, developing 850 H. P. Crude oil is used as fuel, the amount used being 135 barrels per twenty-four hours. That amount is hauled daily from Cochise station at one load with a twenty-horse team. The mill tailings are impounded below the mill and are expected to he treated at some future time. The manager is H. Brockman, with A. Y. Smith Supt., D. T. Swathing mill Supt., Meyer Bros. day and night mine foremen.

Pearce, Ariz., Jan. 9.

Transvaal, South Africa, Mining.

J. H. Hammond says to a Boston News Bureau representative: The South African unpleasantness is an interlude in the Transvaal's mining history, a result of its mineral wealth and prohahly a necessary evolution in its mining progress for the aholition of the old ahuses.

The prize of the struggle—the Witwatersrand, or White Waters Range—is unique in the world's mining records, and I do not wonder at the growing enthusiasm in London at the prospect that it will soon he recovered. London is renewing its old interest in Kaffirs, and is planning great things in that line.

The Rand is the world's richest storehouse of gold, all in what the West would call a little patch of ground, 25 miles either side of Johanneshurg. It resemhles anything hut a mining district, having the appearance of a grazing country. The reefs are accessible and rather easily worked. The deposits are unique in their unparalleled persistence of ore, which is interspersed in the quartz and sandstone. It is not of very high quality, yielding ahout $10 per ton. There are ahout 10,000 stamps in the district, which can crush 7,000,000 tons a year. The war has hlown over Johanneshurg without doing any vital damage to the plants.

Since its discovery in 1885 the Rand has yielded $400,000,000 in gold, and just hefore the war was yielding at the rate of $100,000,000 a year, or one-third the world's production—a rate which some years hefore, when the yield was hut $35,000,000 a year, I predicted would come hefore the end of the century.

Yet with all this richness there may he some disillusionment in the next generation. The reefs, it is true, are over a mile deep, and conditions favor deep mining. The increment in temperature is only 1° for 200 feet, so that we can mine down 10,000 feet. The deposits, however, are not, as asserted, practically unlimited. I helieve the future life of the Transvaal will not exceed thirty years, which means a yield of not much more than $3,000,000,000. In eight or ten years after peace the Rand will have reached its zenith.

The diamond mines at Kimherley will go on longer. At Kimberley they have in thirty years mined fifteen tons of diamonds, worth $500,000,000. The De Beers Co., which controls the output and restricts it according to the market, produces yearly 2,000,000 to 3,000,000 karats, worth $20,000,000. A syndicate purchases the whole output at $5 to $8 per karat. The life of the mines is indeterminate, the company estimating it at 144 years. Mining has heen carried down 1600 feet, mostly in extinct volcanic craters.

In South Africa we compress centuries of mining history into decades, and we hold the world's record in mining for rapidity in exploitation, drilling and hoisting. At Kimherley 2000 tons have heen hoisted up a 1600-foot shaft in one day, while at the Simmer & Jack we sent down a 22x20 shaft ahout 220 feet in one month. We had at any expense got men from the Calumet & Hecla and other companies to do this, hut the work was really done not hy them hut by young fellows just out of college, whom we told to go ahead and use their hrains. South Africa rivals America in disrespect for tradition. In fact, its hrightest pioneers are Americans, and the leading figure among Johanneshurg engineers is Hennen Jennings, a Harvard graduate.

There are many prohlems ahead of the Rand, the chief being that of power. There are no navigable rivers, and practically no waterfalls. The Kaffir, of whom there are 100,000 in the Rand, is lazy and dissolute, and the war has made him worse and scarcer, while the climate makes white menial lahor impossible. The Kaffir will work only long enough to buy a few wives to support him the rest of his days. If it can be done, he must be regenerated and his trihal organization disrupted. Then there are questions of improved mining processes aud of further exploitation, as of the Randfontein, which I recommended in 1899.

After the Rand is worked out there will be little outside of Kimberley worth fighting about. The only other gold deposits are those which were worked in Rhodesia in prehistoric times and are supposed to he those of King Solomon and the Queen of Sheha, which yield about $3,000,000 a year. The country can never support a large population, its resources ahove ground heing meager. Coal and iron are scanty and inferior, and copper deposits insignificant.

Every field of activity in the whole realm of nature may yield something of value to the engineer. His interests are world-wide. As man has climhed slowly up the rugged pathway we call civilization, he has needed more and more the services of the engineer. What was yesterday a theory hecomes a demonstration to-day, and to-morrow we expect the engineer to apply it for our comfort or convenience.

Acme Gas for Mining Operations.

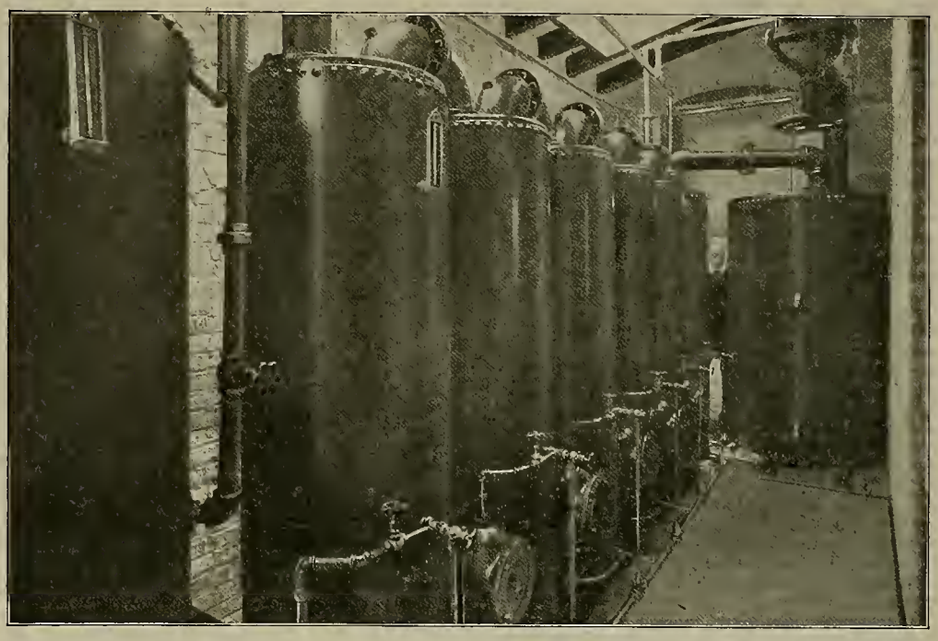
A new fuel is being placed upon the market of importance to mining interests because of its general availability, its low cost, and its adaptability to the requirements of mining operations, such as roasting ores, smelting and running gas engines.

The Acme Gas Co., Monadnock block, Chicago, manufactures and installs individual plants, in which they state that mine operators can generate their own fuel in the form of gas for 10 cents per 1000 cubic feet. The plant is simple and made in many sizes, from a plant suitable to run a 25 H. P. gas engine, or do a limited amount of furnace work, to one producing 100,000 feet of gas per hour.

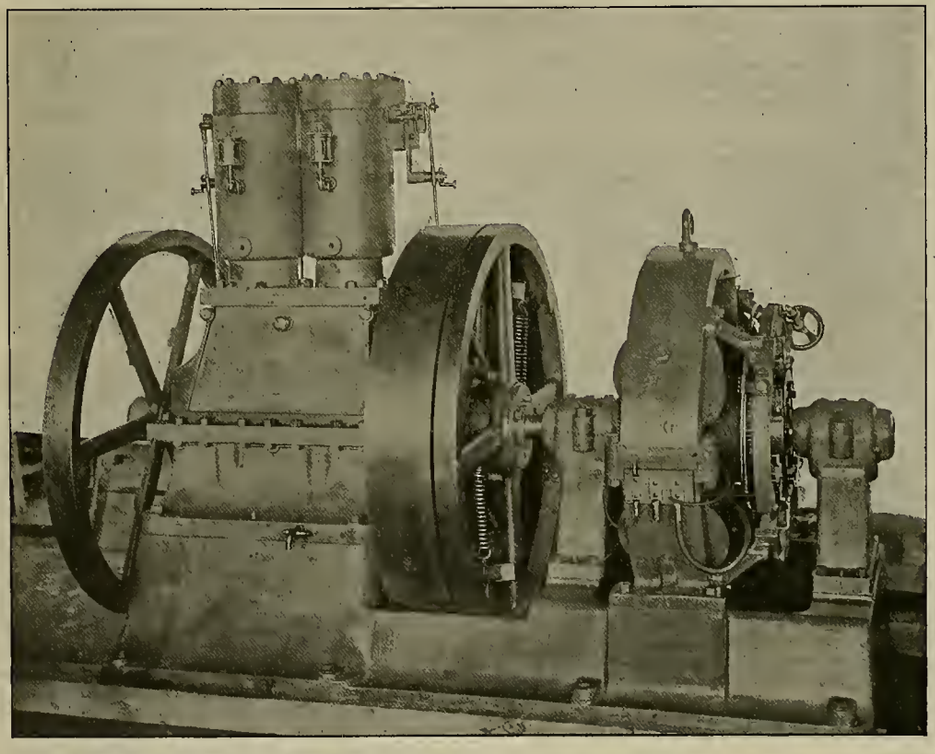
Acme gas is of high calorific efficiency, having several times as many heat units as producer gases, and the manufacturers say the plants are cheaper to install and the cost of maintenance much less than in producer systems. Acme gas is made from crude distillate of petroleum, which contains gas-making properties, and as 1¾ gallons is stated to be sufficient to generate 1000 cubic feet, enough raw material can be transported in comparatively small bulk to generate many thousands of feet of gas; it should be necessary to carry no waste materials.

The recent oil developments in California and Texas have so reduced the cost of petroleum in the West as to make the economy of Acme gas in mining districts very great.

The introduction of Acme gas for use in connection with gas engines has reduced the cost of producing power, making gas engine power cheaper than steam power, even in districts where coal is cheap. As



Cut Showing Generators of a Typical Acme Gas Plant.



Direct-Connected Nash Gas Engine and Dynamo, to be Run With Acme Gas.

nearly as can be estimated, the gas contains 450 B. T. U. to the foot. Thirty feet develops 1 H. P., and with gas at 10 cents the cost per horse power hour is less than one-third of a cent. By this means electricity can be generated cheaply.

Mack Con. G. Mine, Big Oak Flat, Cal.*

Written for the MINING AND SCIENTIFIC PRESS by C. L. LANG.

The Mack Con. G. M. Co., the surface plant of which is here illustrated, is situated at Big Oak Flat, Tuolumne Co., Cal., and consists of two claims, the Mack and the Wooten, being 2300 feet in length, of the Longfellow lode—a contact vein between granodiorite and slate. The vein averages 10 feet in width and has two known shoots each over 300 feet in length, from which mill runs already made show good pay values.

The mill building is 50x70 feet, framed with 8x8 timbers set on a concrete foundation, and covered with galvanized corrugated iron. Ten stamps are now in place, and the plan is arranged for ten more which will be added later.

A new incline two-compartment shaft is being sunk and is now down 270 feet. A station has been opened at the 200 level. The ledge at this point shows over 12 feet in width of soft "sugary" quartz, 4 feet of which will mill over $8 per ton in free gold. The shaft is equipped with a 30 H. P. Lidgerwood model hoist, capable of sinking to a depth of over 1000 feet. One 80 H. P. steel boiler, a 75 H. P. Westinghouse engine to run the mill, a 150 H. P. air compressor, not yet completed, constitute the motive-power equipment. It is intended by the company to run the air compressor by electric power, to be brought in shortly from La Grange dam, distant 18 miles. The using of steam will then be discontinued. There is an arrangement of water tanks by which the tailings from the mill are settled and the water used over and over again, everything connected therewith working almost automatically.

*See illustration on front page.

Protective Timbering in Shaft Sinking.

TO THE EDITOR:—I note in your paper of Dec. 28, 1901, in an article by W. H. Storms, on "Small Things in Mining," a description of fenders or shooting timbers for protecting shaft timbers from flying rock when sinking. I think that I use a simpler mode of fastening them than bolting. I take a chain of about $\frac{5}{16}$-wire, cut it in suitable lengths and put a grabhook on one end. A small notch is cut in lagging near the ends of wallplates and the chain put around the wallplate and shooting timber, catching the hook in a link on top. This holds the timber securely, with no holes to bore, no bolts to stick or nuts to drop in sump. If the timbers hang a little loose, so much the better, as they give a little to the rock in shooting and will not break so easily when struck by the flying rock. To have them tight up to the wallplate, drive a wedge on top between the wallplate and chain. I have found the chain much better and quicker than bolts to put on and take off. I prefer a half-round timber for fenders, as it does not appear to wear as fast as square timber. I use them all round on wallplates and on centerpieces, and my plates are hardly marked with the rock.

Liscum, Ariz., Feb. 10, 1902. JAMES F. SMITH.

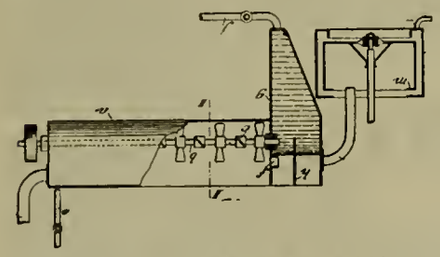
Forge Shop, Navy Yard, Washington, D. C.; Small Ingot Furnace Open, in Operation, With Gas Turned on Full Capacity.

Mining and Metallurgical Patents.

Patents Issued February 11, 1902.

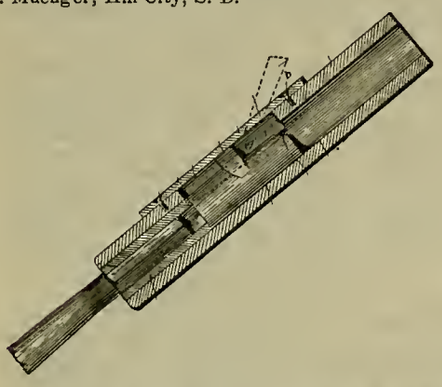
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR SEPARATING MINERALS BY SELECTIVE ACTION OF OILS.—No. 692,643; A. S. Elmore, London, England.



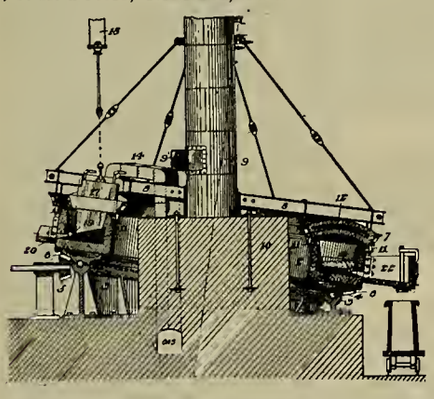
A trough, a shaft adapted to revolve within trough and provided with inclined blades, pipes for delivering oil and water to trough, a subsidence tank arranged at one end of trough, extending below it and communicating therewith, tank adapted to receive liquid mineral pulp and oil from trough, a vertically extending partition arranged in tank at top for purpose set forth, a centrifugal drum arranged at one side of tank, a pipe connected to tank and communicating with drum for discharging into it metallic ingredients and oil, and a pipe connected to tank for discharging earthy and rocky ingredients.

DRIFT PIN FOR DRILLING MACHINES.—No. 693,049; F. Muenger, Hill City, S. D.



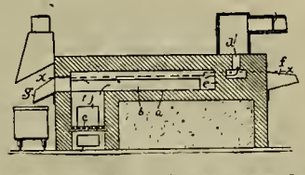
One end portion cylindrical and adapted to engage a bushing when inserted in spindle and its other end portion flattened, and provided with a projecting transverse rib on its side intermediate its end portions by which it can be driven.

TREATING ORES OR SIMILAR MATERIALS.—No. 693,313; J. A. Potter, Cleveland, Ohio.



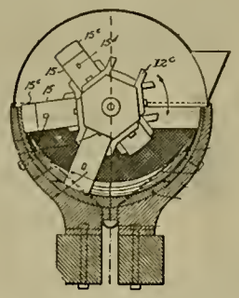
An annular body, and stationary roof, means for rotating body, a charging opening leading into furnace, and having partitions at both sides, furnace having an inlet for combustible fuel, and a stack outlet, stack being in proximity to charging opening and fuel inlet being at a more remote point.

FURNACE FOR REFINING LEAD AND ZINC FUME.—No. 692,972; F. L. Bartlett, Canyon City, Colo.



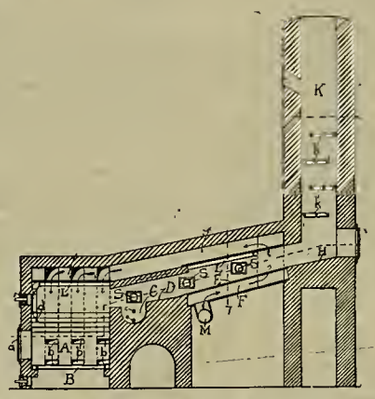
A flat hearth, a feed opening at one end and a discharge opening at other end, a fire box on each side of discharge opening below level of hearth, vertical flues leading from fire boxes to hearth and bridge walls extending diagonally from front to sides, separating fire boxes from hearth.

PULVERIZING MILL.—No. 693,089; C. Wallace, Denver, Colo.



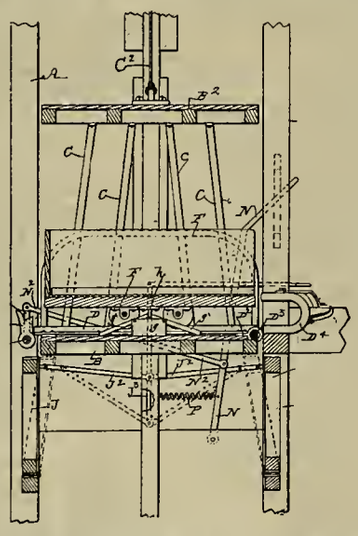
A suitable mortar or casing, a rotary prism-shaped yoke or stamp holder, provided with openings and having hollow journals, whose openings communicate with adjacent stamp openings of yoke, stamps located in openings in which they are normally adapted to slide, each stamp adjacent journal having a recess, and a pin located in opening of each journal and adapted to enter recess of adjacent stamp whereby latter is locked from sliding movement.

ROASTING, SMELTING AND MATTING FURNACE.—No. 693,076; W. D. C. Spike and J. T. Jones, Tacoma, Wash.



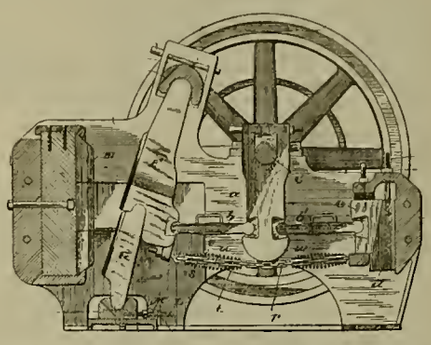
The combustion chamber, smoke stack, metal well, melting hearth and roasting hearth located adjacent to each other and communicating one with another and located between combustion chamber and smoke stack, and preliminary roasting means, consisting of a number of tilting grate bars located one above other in smoke stack at opposite sides of stack, the inner ends of grate bars along one side of stack extending over bars projecting from other side and adapted when tilted to discharge contents onto opposite set of grate bars, and inner ends of both sets of bars terminating short of adjacent wall of stack to cause products of combustion to pass in a zigzag course through stack and around grate bars.

CAR DUMP FOR ELEVATORS IN MINES.—No. 692,888; J. Moses, Youngstown, Iowa.



Parallel uprights fixed in shaft, frames pivotally connected at their lower ends to parallel shafts, rods pivotally connected with upper portions of frames, a lever connected with rods for adjusting frames, a cage fitted between parallel uprights, track rails for car pivotally connected with one edge portion of floor of cage, hook-shaped stops fixed to crosspiece at top portions of uprights for engaging car wheels, detents pivoted to top and central portion of floor of cage for detachably fastening car, a car on track rails, an iron fixed on under side of car to engage detents, a rock shaft journaled to uprights of frame in shaft, props fixed to rock shaft to support free ends of track rails, means for adjusting rock shaft and props and means for raising and lowering cage.

ROCK BREAKER.—No 693,288; G. Lowry, Tiffin, Ohio.



A stationary jaw, a vibrating jaw comprising a lower section supported and fulcrumed at lower end, an upper section supported by lower section and having a bearing upon upper edge of lower section, upper section also being provided with a bearing and fulcrum at upper edge and means for operating the vibrating jaw.

GAS DETECTING ATTACHMENT FOR MINERS' SAFETY LAMPS.—No. 692,885; M. D. Mackie, Scranton, Pa.

A miners' safety lamp, a gas detector comprised in a sheath or tube extending vertically through bowl of lamp, a sliding rod extending through sheath and slidable therein, the sliding rod supporting a loop of platinum wire or other substance having an affinity for burning marsh gas, the substance being supported directly over flame of lamp and shiftable upward and downward, together with a graduated scale for indicating the various percentages of gas according to effect of flame on substance aforesaid.

PROCESS OF TREATING ORES.—No. 693,148; E. B. Parnell, Carshalton, England.

The subjecting of refractory ores to the action of chromic acid and then roasting them.

The Commercial Importance of Aluminum.

Taking the specific resistance of aluminum at 2.76 and copper at 1.696×10^{-6} ohms (Matthiessen's standard) at 15° C., the diameter of the aluminum wire will be 1.27 that of the copper. For equal conductivity it follows that the insulation on covered aluminum wires will be greater, but the covered wire will be still less in weight than the copper. It is as a bare conductor for long-distance transmission that aluminum has been largely used, and it is therefore necessary to consider the tensile properties and change in length due to change in temperature. The commercially pure aluminum alluded to above has, when in the form of wire 0.126 inch (3.2 millimeters) in diameter, a breaking load of 28,200 pounds (12.6 tons) per square inch, a limit of elasticity 19,376 pounds (8.65 tons) per square inch and percentage extension 0.19 within the limits of elasticity with an applied force of 16,250 pounds (7.2 tons) per square inch. Alloying this aluminum with copper, zinc, nickel or iron in varying proportions to the extent of about 2%, increases the tensile strength at the expense of conductivity. The tensile properties of aluminum are increased by rolling, hammering or drawing. In testing wires, therefore, different results may be obtained from the same material by varying the amount of drawing down. Copper and nickel-copper alloys can give about twenty tons breaking load, sixteen tons limit of elasticity, percentage extension 0.19 with 7.2 tons per square inch applied and conductivity about 52% of copper. Hard-drawn copper has a breaking load of about twenty-eight tons and limit of elasticity twelve to thirteen tons per square inch, a percentage extension of 0.10 with 7.2 tons applied per square inch and a linear coefficient of about 0.000017 per 1° C.—Electrical Review.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

JUNEAU.

The Yellow Jacket M. Co., T. H. Ellis president, of Seattle, Wash., has changed its plans regarding the erection of a stamp mill on its Windham bay properties, and now proposes to joint the California-Alaska M. Co. of Los Angeles, Cal., which owns two claims on the same ledge in the joint construction of a 20-stamp mill to mill the output of both properties. The mill is to be erected on the Yellow Jacket property, utilizing its water power, each company to share the costs of developing the water power and erecting the plant. The erection of the plant projected will begin in the spring about May 1.

The Mine Securities Co. of New York have made a contract to buy the control of the eighteen claims making up the Northern Belle G. M. Co.'s property at Berners Bay. The Mine Securities Co. have agreed to enlarge the present milling plant of 200 ton capacity to one having a 1000 ton daily capacity. Mill runs show average values of from $6 to $10 a ton, and it is estimated that in a 1000-ton plant the costs will be less than $2 per ton. A water power is to be utilized to run the mill and air compressor plant.

The Treadwell mine and mill works on Douglas Island caught fire on the 11th inst. The Alaska-Mexican compressor building was entirely destroyed; $38,000 on the stamps, mill plates and the 120-stamp mill, with the engine room, were saved. For several hours more than 100 miners were in the lower workings and in danger of death. The fire started in the Mexican compressor building and spread to the hoist building and tramway before warning could be sent to the men in the mines. No lives were lost. The origin of the fire is not known.

ARIZONA.

MOHAVE COUNTY.

J. P. Wallace, manager of the Monmouth Dev. Co. at Kingman, has bought of J. A. Smith and W. D. McCright the Telegraph mine, on Burro creek, and has bonded the Burro mine, adjoining. A sampling of the mines indicates an average ore value of more than $10 in gold and silver. Mill sites have been located and a site for a dam in Burro creek and flume have been selected. It is the intention of the company to generate power from the stream for mining and milling purposes.

The Lenore M. Co. has its new mill machinery on the ground at Hardyville, and has started to put it up. The company has a bond on the Rattan Ruth mines. The ores from the shaft of the Rattan are said to carry high values.

In the north drift in the Tennessee mine, Chloride, a new ore shoot has been cut, the ore from which, it is said, will run hundreds of ounces to the ton in silver.

PIMA COUNTY.

A high-grade copper mine near the Gila river is being worked under bond by Soto & Hooker. There is about 100 feet of work done, and shipping ore is being taken out. Shipments are being made. The ore is packed on burros over the mountains to Willcox, a distance of 60 miles. The mine is owned by Cleland Bros. of the California ranch, near Tucson, who have bonded it to Soto & Hooker.

The Calabasas Copper Co., in the Santa Rita mountains, has commenced the production of high-grade copper bullion. This company is organized and operated by Douglas, Lacy & Co., of New York City.

Ground for a smelter at Pima has been secured by St. Louis people, who expect to commence the erection of a plant in a short time.

PINAL COUNTY.

The Mammoth gold mine at Mammoth has been sold to F. W. Fletcher of Alpena, Mich., representing the bondholders, by the receiver—G. P. Blair—who had been made Supt.

The Bobtail M. Co. has bonded the Miller gold claims, on the Gila river, near Florence. The vein is from 10 to 12 feet wide and regarded as a $10 per ton proposition. The present development is 175 feet.

The Newbury mines, 18 miles northeast of Florence, are now being operated by a Boston, Mass., company. A hoist and pump are being placed on the Lander claim, which is one of the group. The present depth is 200 feet. The latest assays are claimed to show gold values of $30 to the ton, forty ounces of silver and 3½% copper. The White Elephant claim has a vertical shaft down 150 feet. The vein is on a contact between porphyry and slate and varies in width from 5 to 10 feet, and the outcropping of the vein is continuous for several miles. On the surface the principal values are copper, and the claims were located for it, but gold seems to be the chief product of the claims at this time. The gold and silver values seem to increase as depth is attained.

A. L. Brooks of California and M. Smith of London, England, have bonded the Westfall copper group, near Florence, from J. Westfall.

YAVAPAI COUNTY.

At the Iron Queen mine of the G. A. Treadwell group, at Jerome, the shaft is now down 200 feet and a crosscut has been started toward the ledge, which Manager E. D. Treadwell expects to cut within ten days.

CALIFORNIA.

CALAVERAS COUNTY.

Work has been commenced on the North Hill hydraulic mines, 3 miles from Milton. A large reservoir at Salt Spring valley will furnish water for hydraulic purposes.

Good rock is reported struck in the Easy Bird mine on French hill, near Mokelumne Flat. The tunnel is in about 150 feet, showing from 2 to 8 feet of ledge. The owner is a Mr. Haywood.

The Angels Quartz M. Co. are preparing to put up a 60-stamp mill on their property at Angels and have started the grading for it.

P. Lancell has made a rich discovery in gravel on his ranch near Mokelumne Hill. A 20-foot shaft opened gravel that averaged 25 cents to the pan.

EL DORADO COUNTY.

Supt. W. E. Thorne of the Gold Bug mine, at Georgetown, states that the hydraulic elevator has been started up and is working smoothly.

It is reported that in the vicinity of Pilot Hill and Centerville more prospecting is being done now than for a number of years past. Shipping ore is being taken from the Little Emma copper mine.—— The Julian quartz mine is being reopened and the Pilot Hill mine is to be started up again by W. A. Freeman and others of Auburn, who have bonded it.——The Wilhelm will be started up again as soon as heavier machinery can be put in.

NEVADA COUNTY.

Work is to be resumed at the Gold Tunnel mine, or California mine, at Nevada City. Supt. Lawrence says new machinery will replace that now on the property.

A strike has been made on the Bonnie Bee mine, near Emigrant Gap, 200 feet in on the main tunnel. A shoot of ore is being opened that goes over $50 per ton. Machine drills are being used and rapid progress is being made in developing the mine. As soon as spring opens a 10-stamp mill will be erected.

S. Jones has bonded P. Curnow's quartz mine near Columbia Hill at $10,600. Mr. Williams is in charge of the development work.

SAN BERNARDINO COUNTY.

At the 300-foot level in the Bagdad mine at Bagdad a 5-foot vein of free milling ore that runs $15 to the ton has been struck. Development work is employing twenty men.

The Roosevelt M. Co., adjoining the Bagdad, has struck 8 or 10 feet of ore claimed to go $50 to the ton. S. Washburn of Pasadena is president and E. E. Selph secretary and treasurer.

SHASTA COUNTY.

The United Copper group of seventeen claims in Flat Creek district has been bonded by W. Candrick, C. Butler, P. O'Mara and T. Montgomery to S. Weil of San Francisco at $16,000. Development work must be commenced within sixty days.

It is reported that the fire in the Mountain Copper mine is about out and that danger to the miners from this source will soon be over. A big stream of storm water has been flowing into the mine and is believed to have finally extinguished it. Streams of green-colored water are now running out of the mine, carrying away copper in solution. To save some of this, the company has sent several carloads of scrap iron and tin to the mine to be placed in the streams, to precipitate it as cement copper.

It is reported that very shortly a smelting plant will be built at Kennet jointly by the De La Mar Co., operating at Bully Hill, and the Trinity C. Co., operating at Kennet. The Shasta King mine, of the Kennet district, is reported sold to Captain De La Mar.

SISKIYOU COUNTY.

(Special Correspondence).—The Yreka M. & M. Co. mill at Rollin made a run from Nov. 23 last to Jan. 2 and crushed 1500 tons of ore, producing about $14,000 in bullion and $6000 in concentrates, the latter averaging about $35 a ton. A lower tunnel 1000 feet long is projected for construction this summer to open the Mountain Laurel vein below the shaft bottom. The present compressed air hoist is operated to full capacity when the mill is running. A new shoot 25 feet wide has been struck in the Mountain Laurel claim. The Ohio, Blanche and Aida claims lying high up on the mountain have been prospected and show large bodies of $6 ore. An aerial tramway is to be put in this summer to get this ore down to the mill.

The Fagundes 5-stamp mill at Rollin is running steadily on ore from that mine.

The Salmon River Co. are working the Myers claim about a mile below Sawyers Bar.

Rollin, Feb. 16.

The hydraulic plant, erected by N. Graves, of Yreka, under contract, has been completed and accepted by the Deadwood Placer M. Co. Necessary preliminary work is being done. F. W. Mahler is Supt.

TRINITY COUNTY.

M. Jones, T. O'Keefe and J. Ryan, owners of the Fairview mine, near Minersville, have the property under bond at $60,000 to the Altoona Q. M. Co. J. H. Porter is Supt. The development work is said to be showing up well.

The late rains have furnished water for mining and all the placers in the county are engaged in washing. At the Sweepstake mine, near Weaverville, three giants are at work using the water from the West Weaver creek.

A strike is reported in the Hall mine at Hall City. The vein is supposed to be a continuation of the Midas ledge of Harrison gulch.

TUOLUMNE COUNTY.

A rich ledge of gold-bearing rock, it is reported, has been uncovered in the Experimental Gulch mine, near Columbia.

The Maier property, consisting of three claims near Jacksonville, has been bonded to H. M. Heath of Boston, Mass., at $18,000. Much development has already been done.

A. Carter has sold to the Blue Eagle G. M. Co. the Blue Eagle Tunnel & Tunnel Site, the Blue Eagle and Elizabeth mill sites, near Carters; also, water right to 200 inches in Jawbone creek.

C. Restano, F. R. Restano and wife, G. Restano and wife, D. Restano, D. Dentone and wife have bonded the Comstock ranch, near Columbia, to the Golden West M. & M. Co. at $30,000.

The Stockton Gravel M. Co. has recently uncovered good pay gravel in its drift mine in the Jupiter district, near Columbia.

Supt. Smith of the Horseshoe Bend mines, near Columbia, says a hoist will be placed on the mine shaft, now down 90 feet, the bottom being in good ore.

At the New Era and California mines on the mother lode near Columbia, Nagel & Thomas, the owners, are doing development work and report getting excellent surveys from rock struck lately.

At the Dreisam mine, near Carters, V. Rosasco, Supt., it is reported that the Yellow Jacket ledge has been struck on the 400-foot level. The vein is a foot wide and very rich. The mill is to be started up.

E. M. Scanavino is working men at the Duffield mine. He has run a drain tunnel, the face of which is 130 feet from the surface. Thirty tons of ore averaging about $15 a ton have been taken out.

YUBA COUNTY.

A Keystone drill has been installed on the O'Brien tract, near Sheep Dip, east of Marysville, where the prospecting, which was commenced last summer, will be resumed. Two other similar drills will also be put to work, while the dredgers are under construction.

COLORADO.

CLEAR CREEK COUNTY.

An application has been made on the part of Denver people for the privilege of mining for mineral under the town of Georgetown. W. Layden already has a concession covering part of the town. The presence of good lodes inside the limits of the townsite has long been known, and in several instances excavations made for purposes other than mining have exposed good veins of mineral.

A contract to drive 128 feet in Tunnel A of the East Argentine M. & T. Co. has been let to Piltz & Dunn, who have commenced work. In the distance to be covered two or three lodes will be intersected.

The contractors on the Mystic Tunnel of the Empire T. Co., at Empire, have completed their contract of 300 feet. The heading is in a large vein showing 4 or 5 inches of solid ore and heavily mineralized throughout.

The preliminary work of survey and proving up of values on fifty claims located by the Marshall-Russell Tunnel Co. at Empire, and development by an 8000-foot tunnel, has been started. A building has been erected at the portal of the tunnel for offices, machinery and blacksmith shops. The main tunnel will carry a double track and a 5-drill machine will operate two large and one small drills in the breast. A trestle over the railroad leads to the waste dump and to a milling plant to be erected by the company. The water power of Clear creek will be used and a flume 1000 feet long will carry the water to a power house containing a double turbine wheel and other machinery necessary.

B. F. Kelly, manager of the Georgetown Deep M. & Trans. Tun. Co., at Georgetown, has bought from Hood & Maxwell the Boston group of fourteen claims on Democrat mountain for $50,000. The ore bodies, which are large, carry galena, pyrite, silver and gold. The entire group will be cut by the tunnel now being run.

It is reported that foreign capital has become interested in the Specht tunnel, started just below Dumont to cut Albro hill. The work is now being done by hand, but it is claimed machinery will go in and the tunnel be pushed for 6 miles to Yankee hill. The tunnel company owns more than 100 claims along the line.

J. O. Collerette confirms the sale of the French Flag mine at Idaho Springs to Cox & Co. The mine has a body of lead ore which carries gold and silver. A gasoline hoist has been installed at the shaft.

CUSTER COUNTY.

The Florence M., M. & S. & R. Co. has been incorporated at Florence, with L. Blaney president and T. H. Newkirk secretary. A large tract of land between Querida and Rosita, including fifteen mining claims, carrying silver and copper, with some gold, has been secured; also a large tract of oil land near Florence is to be developed. The cost of hauling and smelting the ore at the Florence smelter will be about $11.

GUNNISON COUNTY.

The Hard Cash group, near Elko, includes several claims on Galena mountain and is owned by the Sulphide Copper Co. of Denver, J. C. Lewis president and H. Miller Supt. Last summer a shipment of sulphide ore was made that paid well. A machinery plant, including power drills, will be installed.

A concentrator of several hundred tons capacity has been built at Elko and will be operating the coming season. It has been designed and constructed to handle the ores produced in the vicinity.

GILPIN COUNTY.

Work has been resumed on the Gould-Burroughs mine on Quartz hill at Central City after being idle for eighteen years. G. H. Graham and associates of Denver have bonded this mine and the First National Kansas, an adjoining property. A new shaft house 40x60 feet will be built over the Gould 600-foot shaft and a hoisting plant set up.

The Central City pool operating on the Continental mine on Quartz hill are making shipments of concentrating ore to Idaho Springs.

D. H. Allen, manager of the State Ore Sampler Co. plant at Black Hawk, claims that the average values of the smelting ores of this county have increased from 50% to 100% within the past year and a half. P. R. Alsdorf, manager of the Standard Assay office at Central, corroborates this, and instanced a number of late settlements for ore—one for $480 gold to the ton, another at $285 and a third at $216 per ton. These show great gains over previous settlements from the same properties and the values have increased very steadily. It has not been a jump from a low value to a high one, but a regular and continuous increase. This condition, they state, is true of all other properties in the county in which depth has been gained and from which shipments have been made during the past year or so.

HINSDALE COUNTY.

The Hotchkiss Mountain M. Co. has bought the mining claims of J. C. Bothwell and J. Foster, located near Lake City. It is said that considerable work will be done on the Black Wonder mine, near Lake City, during the coming season.

LAKE COUNTY.

The Penn M. Co., at Leadville, is making a steady production of between forty-five and fifty tons of siliceous ore per day. In order that the siliceous material can be moved at all from any of the properties on Breece hill, it must stand a $9 treatment charge, so that the grade must run close to an ounce in gold. Some of the mineral from the Penn, it is claimed, has done much better than this.

The Midas M. Co., at Leadville, is increasing production and the development work ahead of the working ground shows an ore shoot of the largest iron body opened up in the camp. The mine is shipping from 200 to 250 tons a day.

The Valley Leasing & M. Co. has been incorporated, capital $1,500,000, by W. H. Vinton of Brattleboro, Vt., E. C. Robert-

son of Hinsdale, N. H., and W. F. Hogg of Springfield, Mass. The company has commenced work here on the Valley mine at Leadville, J. W. Dean of Aspen being Supt. It has been decided to sink a new shaft 4½x9 feet, in order to reach the oxidized zone of ores of the New Monarch group.

A strike is reported on the mine of the Black Prince Co. at Leadville. Development work at the 300-foot level, it is said, has opened up a large body of high-grade ore which carries gold, silver and galena values. The ore body is in the contact formation beneath the lime. Among those owning in the Black Prince is C. Westlake, manager of the company.

LA PLATA COUNTY.

The discovery of gold west of Trimble Springs and about 10 miles north of Durango is announced. The district was prospected nearly twenty years ago, but values found then could not be mined under the then costs of mining, transportation and smelting. Changes in these costs make it probable that the district can now be worked. Ores shipped to the local smelter show, it is claimed, that the average value has been about $50 per ton. Very little work has been done to determine the quantity of the ore.

MINERAL COUNTY.

The Home M. Co. will, it is stated, probably put in a power plant at the mouth of the Nelson tunnel, consisting of a boiler and compressor.

ROUTT COUNTY.

The Wolverine M. Co., on Big creek near Pearl, is doing development work. There is a showing of 3½ feet of ore, carrying copper, silver and gold to, it is claimed, about $100 per ton.——The Zerke M. Co. has completed its plant and is now sinking on the vein, which shows 4 to 8 feet wide, with 4 to 5 inches of copper glance, oxides, carbonates and sulphide. ——G. M. Harding is the owner of two groups of claims in which good ore has been found.

SAN JUAN COUNTY.

The Green Mountain M. & M. Co., of Silverton, have mapped out a plan of development for the season, including $10,000 for contracts to be let to push the developing levels ahead. W. Bielefeldt has been appointed Supt. He says that should the result of the proposed development show as well as at present, the company will commence the erection of a 100-ton mill.

SAN MIGUEL COUNTY.

The Ophir Con. M. Co. has decided on the erection of a 50-ton stamp mill at Telluride, to cost about $62,000.

The Telluride M. Co. reduction plant, which is being built south of Colorado City, is being enlarged to a capacity of 300 tons daily. The mill employs the bromocyanide process.

SUMMIT COUNTY.

The Augusta M. & M. Co. at Breckenridge, T. R. Griffith manager, has started to upraise from the tunnel level to the bottom of the Juventa shaft. The vein, cut 1100 feet in from the tunnel mouth, is under the old workings. A proposition to use a core drill to prospect the character of the ground ahead of the tunnel is under consideration.

The smelting plant of the Robinson Con. S. Co. at Robinson will be completed within the next two months. There are two pyritic furnaces on the ground, one of them in place. The stack, dust flue and hot air chamber have been built. The power plant will be installed later. Fred G. Bulkley is manager.

The Warren Leasing Co., W. A. Johnson manager, has bought the Juniata property near Breckenridge from M. G. Evans. The property has recently been unwatered and drifting from the bottom of the 300-foot shaft has commenced. C. King is foreman.

TELLER COUNTY.

Ore running from 2.5 ounces in gold to 2000 ounces to the ton in gold has been opened up on the Laura Lee claim on Mineral hill, at Cripple Creek, by S. Peterson and O. Stone, who have the claim leased from F. J. Campbell. The streak, about 8 inches across, shows free gold in the seams in the rock, some of the pieces being as large as a $5 gold piece. A whim will be installed temporarily, until a steam plant can be secured.

The Woods Investment Co., owning 1500 acres of land in Cripple Creek district and controlling forty-two companies, has about fifty different leases in operation on their properties.

F. M. Woods, manager of the Gold Dollar Con. M. Co. at Cripple Creek, says the company has bought a new hoist capable of lifting from 1500 feet. This equipment will be supplemented with a battery of boilers capable of furnishing 280 H. P and a 5-drill compressor.

T. J. Moynahan and associates have granted five leases on blocks of ground lying between the Laura Lee and Cripple Creek for two years. The lessees are to go to work immediately. The company has decided to lease all its Mineral hill property — about 200 acres—in 5-acre blocks for two years at a royalty of 15 cents flat net. In addition, the owners offer a reward of $500 to the first lessee who sends to the reduction plants the first carload of ore that runs over one ounce to the ton.

The Longfellow property, owned by W. S. Stratton, is to have the largest shaft in the Cripple Creek district. The new shaft will be 6½x20 feet in the clear. A large flow of water is anticipated and an immense pumping plant, as well as the most improved hoisting machinery, will be installed there.

The Elkhorn Con. Virginia G. M. Co.'s tract of four acres on Carbonate hill, at Victor, is reported bonded to S. Pullin at $20,000. The shaft is down about 180 feet and considerable crosscutting and drifting has been done.

The Cripple Creek & Boulder Leasing & Dev. Co., owners of the Ella claim at Victor, are putting in an entire plant of new machinery, consisting of a steam hoist and a new 60 H. P. tubular boiler. The main shaft is down 400 feet and by March 1 work will be resumed sinking to 500 feet.

W. A. Otis & Co. of Cripple Creek have thrown all of their idle territory open to lease. It is stated that the terms will be low, and it is believed every block will be working as soon as leases can be made out.

The Rockland G. M. Co. of Maine proposes soon to begin development work on Little Bull mountain at Cripple Creek. The company owns twenty acres there, and has a vein 6 feet wide which carries values from $8 to $12 a ton. A. Cochran of Victor is president and F. H. Swayne of Lynn, Mass., secretary and treasurer.

The Woods Investment Co., it is understood, have decided to take the entire product of the Wild Horse mine and treat the ore at the Economic mill. An experiment on this ore by mill treatment resulted in a success, practically and economically. Some of the ore runs as high as thirty-five ounces per ton. Manager F. M. Woods believes that he could treat this high-grade mineral more successfully in the mill than in a smelting plant.

IDAHO.

ELMORE COUNTY.

A strike is reported from the Ida claim in the Neal district. At a depth of 62 feet a crosscut has opened 18 feet of ore. The average value in gold is about $25 a ton.

IDAHO COUNTY.

The Crescent Con. M. Co., Ltd., has been incorporated, capital $100,000, to absorb the Crescent G. M. Co. and the Columbia G. M. & M. Co. Its office will be at Pierce City. The directors are W. Sweet, L. Baughman, J. Q. Moxley, D. C. Gribble and H. N. Stanton.

The Consolidated Hydraulic Co. of Pontiac, Mich., has made a first payment upon 200 acres of high bar placer ground, situated on both sides of Salmon river opposite Slate creek, near Grangeville, and expects to expend $15,000 in piping water from Slate creek across the river.

OWYHEE COUNTY.

The Sinker Creek tunnel at Silver City, it is reported, has opened a 2-foot vein carrying 6 inches of good ore. The tunnel has been driven about 6000 feet and is to be run about 1000 feet farther. The face is 2100 feet under the crest of the mountain.

SHOSHONE COUNTY.

The Golden Chest M. Co., at Murray, has installed its water power. There are two wheels, a 5-foot one driving the twenty stamps, the rock breaker and the tailings plant, and a 4-foot one working the air compressor, the pumps and the dynamo. They are fed from a 22-inch pipe with a perpendicular fall of 220 feet. The machinery has been driven by steam for about seventeen years.

The air compressor on the Charles Dickens mine, near Wallace, is in operation and development work is to be continued. The mine is bonded to J. M. Patterson of Pittsburg, Pa.

MICHIGAN.

HOUGHTON COUNTY.

M. R. Goldsworthy has obtained from the U. S. Government the right to remove the Osceola stamp mill tailing sands from the navigable waters of Portage lake to recover copper from them. These sands form a great obstruction at the site of the old Osceola mill above Hancock, almost shutting off the entire channel. Goldsworthy will start at the water's edge, dredging up to the tailings to a depth of 24 feet. It is not stated what process will be used in the recovery treatment.

MONTANA.

FLATHEAD COUNTY.

(Special Correspondence).—At the Snow Shoe mine thirty-five men are employed. It is reported that 3½ feet of clean shipping ore has been struck. Supt. D. Bowers anticipates by spring to work a full crew of 200 men in the mine and mill. The hydraulic mining companies of Upper Libby creek are preparing to begin operations with the opening of spring. Some rich placer ground was opened last fall on the Vaughan & Greenwell claim. The ledge on the Cedar mine has widened from 2 to 5 feet. J. L. Scarlett of Libby, the owner, claims assays of $160 per ton. The gold is coarse and the vein is believed to be the source of a portion of placer gold in Libby creek claims. Work on the Mother Lode Co.'s property, near Libby, is to be resumed early in the spring.

The American Kootenai Co. are preparing to put in an electric plant to operate electric drills. At the Brick & Brannegan mine about twenty men are employed. It is announced that ten more stamps will be added in the spring. Cabinet, the postoffice center for the West Fisher gold belt, is having a substantial growth. Considerable clearing is being done and new buildings are going up.

Cabinet, Feb. 8.

GRANITE COUNTY.

D. Armes and associates of Butte have leased the Royal mill near Philipsburg. From eight to ten men are employed. A. B. Ringeling is in charge.

JEFFERSON COUNTY.

At the Buckeye mine, near Basin creek, the new shaft has tapped the old workings. The Buckeye is a well equipped plant and is being worked by the Buckeye M. Co., of which C. J. Davis is the head.

N. W. Pierson of Butte has leased the Miner, near Wickes. The mine is developed by tunnels, one of which is in over 2000 feet. The ore contains gold and silver and averages about $30 per ton. The output at present is from eighteen to twenty tons per day.

A strike of high-grade ore in a 5-foot vein is reported at the Baltimore mine, near Basin. The property is owned by S. Mackey and is operated under lease and bond to W. Owsley of Butte and S. D. Pritchett of Boulder.

LEWIS AND CLARKE COUNTY.

J. H. Longmaid of Helena has taken a four-year bond at $50,000 on the Columbia, Winthrop and Railsback claims in the Seven-Up Pete District, about 60 miles northwest of Helena. The property has a shaft 300 feet deep and 1000 feet of levels. The vein is from 4 to 7 feet wide and gives values of from $6 to $7 a ton, but is said to be difficult of reduction.

As the result of experiments conducted at the cyanide plant constructed last summer to treat the tailings at the Empire mine, at Marysville, a method of precipitation from the cyanide solutions by electrolysis is to be installed. The process is stated to be a modification of the Pelatan-Clerici process. The process consists of passing a current of electricity through a weak cyanide solution containing the gold, silver and other metals, and by the electric current depositing the precious metals upon a series of cathode plates suspended in the solution. At Empire a solution as low as one-tenth of a pound of cyanide to a ton of water is used with success and found to dissolve the gold and silver and not attack the other metals.

MADISON COUNTY.

The Wall Street M. Co. is operating a group of seven claims near Sheridan. Necessary improvements are being made about the mines. W. H. Godfrey is manager.

F. Field of Pony has taken a lease to work the tailings of the Easton mill at Junction, and will install a cyanide plant of moderate capacity. It is reported that the tailings of the Easton mill contain good values.

PARK COUNTY.

The Standard M. Co., C. R. Murdock manager, is operating the Great West, Minnie and Standard claims, near Contact. A 10-stamp mill has been erected and will be started up.

The Milwaukee M. Co., J. M. McNulty manager, is doing development work and getting out ores from its mines at Contact. At present the mill has fifteen stamps, but ten more will be installed in the near future.

TETON COUNTY.

The Chief Mountain M. Co. has been incorporated in Salt Lake City, Utah, to develop a group of claims in the Kennedy Creek district. The incorporators are J. H. Van Pelt of Main, Mont., F. Mazreli of Cardston, Canada, B. F. Caffey, Frank Pierce and E. B. Critchlow of Salt Lake City, Utah, Mr. Van Pelt being the agent in Montana. The capital is $30,000 and the head office at Salt Lake City. The claims are the Group, Sunday, Two For Chief and Abbie Belle.

NEVADA.

ESMERALDA COUNTY.

J. A. Yerington is arranging for the resumption of work in the Pamlico and Lapanta mines in Hawthorne district by an Eastern company.

NYE COUNTY.

The town of Ray, 10 miles north of Tonopah, where the new rich discovery has been made, is a camp with about 200 miners at work upon the leases. The ledges widen out as depth is attained and assays are claimed to show the ore increasing in value on several of the different leases. The following are the results of recent assays made: Keen & Co., $606 27; L. O. Ray, $875.13; August Kunze, $527.01; Lease 17, $387; O'Brien & Co., $916.52; Booth & McKinzie, $575.70; Powers & Co., $482; Gleason & Co., $366.60. Other assays along the ledge range from $12 to $250.

August Kunze & Co. are sacking shipping ore from their lease at Ray that will net them, they say, $200 per ton.

Several leases have been sold, varying in price from $1000 to $2000.

WHITE PINE COUNTY.

The Saxton mine shaft at Ely is down 212 feet and a station is being cut.

The shaft in the Aultman has now reached a depth of 94 feet and shows a large body of ore.

NEW MEXICO.

LINCOLN COUNTY.

A. R. Byrd is developing his Free Gold claim on Bonito creek. At a depth of 20 feet the tunnel shows more free gold than did the surface find. Several thousand pounds of the ore have been taken out for a mill test. A hundred assays made are claimed to average about $100 per ton outside of the rich pockets. It is reported that J. A. Eddy has bought the holdings of A. R. Byrd and J. H. Collard on the South Bonito, consisting of several rich gold claims. Byrd & Collard have let a contract for the sinking of 100 feet on the Crow claim on the South Bonito.

RIO ARRIBA COUNTY.

The King Richard G. & C. Co., at Bromide will soon build a 10-stamp mill on its property.

TAOS COUNTY.

(Special Correspondence.)—The Fraser Mountain Copper Co. is erecting a concentrating and smelting plant in the Rio Hondo district, 20 miles from Taos, and the town of Twining has been started there. The plant building is 100x170 feet, enclosing all the concentrating and smelting equipment. Power is to be supplied by water, a mile of pipe conveying it from the Lake fork and Hondo to four Pelton wheels at the mill. The plant includes a dynamo and an air compressor. A 2300-foot tramway is to be built between the mine and mill. Wm. Fraser, the locator of the property, is manager; the principal stockholders are New York and New Jersey men. C. L. Buckingham, of Denver, Colo., is directing the mill construction.

H. Dorn of Cleveland, O., is at Red River in the interest of the Woodland M. Co., which owns the Abraham Lincoln and other claims at Red River. It is stated that the company proposes to resume operations on the Abraham Lincoln claim soon. Good ore has been discovered on this property.

OREGON.

BAKER COUNTY.

Lack & Schmitz of Baker City, agents for the Sampson G. M. Co., have bought from A. W. Ellis & Co. the Venture, Risk, Mikado and Sampson claims, which are situated in Cracker Creek district, near Baker. The claims transferred have been worked by a tunnel now in 315 feet on the ledge.

JACKSON COUNTY.

W. H. Jackson, C. Baker and J. H. Ray of Medford have located twenty cinnabar claims between Elk and Trail creeks. Where discovery was made the ledge is said to be 50 feet wide, and its length, as far as the locality has been prospected, is from a quarter to half a mile. The ledge matter is very heavy with quicksilver. Men are now at work making excavations and running a tunnel. The mine is about 27 miles from Medford.

The Smith Bros., of Grants Pass, have bought of McDonald & Ray the bond they held on the Hawkeye mine, owned by E. Ray of Gold Hill. Cox & Lyman made a good stake out of it when it was first discovered. E. Ray later took out at different times several thousand dollars; then the sellers of the bond made a small strike in the beginning of the present winter. The shaft is now down 200 feet and the mine is considered better than at any time before.

JOSEPHINE COUNTY.

H. M. White is developing the Black-

well quartz mine, recently bought by him in the Humbug district, near Grants Pass. The quartz carries good values in free gold. A mill has been bought and will be installed soon.

The Crystal Spring M. Co. of Grants Pass has been incorporated by H. A. Reed, C. C. Daniels and B. H. March; capital $20,000.

C. R. Paris of Santa Ana, Cal., has recently bought a group of placer claims on Whiskey creek, below Mt. Reuben, from G. Smith. The mine has a new ditch and a partial hydraulic equipment.

B. E. Meredith of the Wilson-Meredith mine on the Illinois, near Kirby, says the mine has been running most of the season with three giants. Considerable gold is being taken out.

The Lucky Queen mine on Jump-off-Joe, near Grants Pass, owned by Corliss & Rush, has been sold by Mackay & Crane, who have been developing it, to A. A. Durphy of Spokane, Wash. This mine is an old property, worked many years ago and abandoned. The new owner will equip it with machinery.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Hidden Fortune M. Co., whose property adjoins the Homestake, at Lead, S. D., are to erect a 250-stamp mill, with cyanide plant capacity of 250 tons of pulp daily.

UTAH.

BEAVER COUNTY.

Sixty-five per cent copper ore is reported found on the 400 level of the O. K. mine, near Frisco. This is the present lowest working. The strike is a seam of red oxide of copper.

BOX ELDER COUNTY.

The Copper Verd M. Co. of Salt Lake City is preparing to start mining in the Newfoundland mountains. The Southern Pacific cutoff, on the proposed route, comes close to the company's claims. Otherwise it would be necessary to haul the ore 25 miles to Terrace, which will not pay. The claims of the Copper Verd Co. have not been developed, but the croppings on one—the Commonweal—assay from 18% to 24% copper, 10 to 12 ounces silver and $2.80 to $3.65 gold.

JUAB COUNTY.

The Mammoth M. Co. at Tintic proposes to install a cyanide plant to treat the low-grade gold-bearing ores now blocked out between the 1500 and 2000-foot levels, and is having tests made to determine the adaptability of the process to the ore.

PIUTE COUNTY.

The capacity of its present mill plant being outgrown, the Annie Laurie M. Co. of Gold mountain has decided to erect a second mill, contemplating an expenditure of about $100,000.

Supt. Gibbs of the Park G. M. Co.'s mine, near Marysvale, says a fine quality of quartz has been struck in the 80-foot level, the vein being 10 feet wide.

SALT LAKE COUNTY.

To provide the most economic transportation for ore between the mines and smelter of the United States M. Co., an aerial tramway is planned. Bids have been invited for the contract by Robert Holden, the company's managing director. The plans decided upon provide for a daily capacity for transporting 1000 tons. The main line will extend over 2 miles and the Old Jordan branch will be 4500 feet. It is expected to reduce the cost of transporting the ore to about 8 cents a ton.

In the York M. Co. mine at Bingham a 10-inch streak of clean galena has been found in a vein 6 feet wide.

SUMMIT COUNTY.

A. H. Mayne has leased and bonded on the Parry group of claims at Park City, and has three men at work cutting a station at the 400-foot mark in the old tunnel. From this station the purpose is to both sink and raise. Work will be kept going all winter.

TOOELE COUNTY.

The Utah C. & G. M. Co. has been incorporated at Salt Lake City, capital $500,000, with J. T. Hammond president and D. R. Hammond secretary and treasurer. The company owns the North Greenhack group of claims and a lease and bond on the Lone Jack, Isabella, American Eagle, Mountain Chief, Anaconda, Black Hawk, Anderson and Nettie Nos. 1 and 2, situated on the east side of Skull valley.

WASHINGTON.

FERRY COUNTY.

J. W. Palmer has bought the Oregonian claim at Republic from J. A. Bauer and H. L. Neville. The ore runs from $1.55 to $8.64 per ton. Mr. Palmer will sink a shaft 100 feet deep, which he thinks will tap the vein.

OKANOGAN COUNTY.

J. B. Chapman, secretary and treasurer of the Wauconda G. M. Co. at Wauconda, states that the tunnel has been driven 1060 feet by two shifts which are making an average of 5 feet per day. No other work, he says, will be carried on until the Rossman mill is ready to receive ore. Experiments have demonstrated that the Wauconda ore can be concentrated, and the capacity of the mill will be made 100 tons daily. An order has been placed for machinery and the mill building is being remodeled to make room for it.

WYOMING.

ALBANY COUNTY.

The Florence mine, originally opened in 1876, and from which a large amount of gold was taken, is to be worked again. The mine is now owned by the Florence M. & M. Co., of which C. H. Marsh of Pueblo, Colo., is secretary and M. N. Grant manager.

FOREIGN.

BRITISH COLUMBIA.

(Special Correspondence).—The Board of Trade has made a very strong protest against the conduct of the Department of Mines at Victoria.

Good reports continue from copper claims at south end of Atlin lake. Gibbs & Lavediere have a crosscut in 140 feet and no hanging wall reached. The ore in sight is reported to go 6% to 24% copper. Many free-milling gold properties are being opened up.

The Momo Mountain quartz mill is crushing.

As there will be a large reduction in freight rates this year on the White Pass & Yukon Railway, several additional hydraulic plants will be installed; also, one large dredging plant.

Atlin, Jan. 28.

The Christopher hydraulic leases on McKee creek at Atlin are reported to have been sold to a company represented by W. I. Scott of New York for $68,000, $20,000 of which is payable March 1. The property consists of seven hydraulic claims and one dredging lease, together with a water right of 900 inches. Work has to be commenced by May 1.

New placer fields are reported to have been discovered on Peace river, north of the Carlhoo gold district, by J. H. Reed, a prospector. Reed says he has found ground that averages $35 per day per man on the surface.

The construction and operation of a smelter on Barkley sound, on the west coast of Vancouver island, is said to be projected by the Pacific Steel Co., of which H. H. Swaney is the head. At present the company operates the Irondale smelter, near Port Townsend, Wash., and the West Coast properties supply ore to it.

The Crow's Nest Coal Co. has reduced the price of coke to large consumers from $4.50 to $4 per ton. The Canadian Pacific Railway, it is reported, has reduced the cost of transporting coke from Fernie to Nelson 25 cents per ton and from Fernie to Grand Forks and Greenwood 50 cents per ton. Owing to these reductions, the cost of coke has been cut 75 cents per ton to the Nelson smelter and $1 per ton to the Boundary plants. The Canadian Pacific has also made a reduction of 25 and 50 cents a ton on coal hauled from Fernie to Nelson and from Fernie to Boundary points, respectively.

The Snow Shoe and No. 7 mines, near Phœnix, are now shipping. Ore sent out of Boundary mines for the week ending 14th inst. amounted to 8124 tons. Total Boundary shipments for the year to date amount to 41,916 tons. The two Boundary smelters treated 7934 tons of ore in same period, making a total for 1902 of 42,344 tons.

IVORY COAST.

A report from Assinio, on the French Ivory Coast, says that a reef of gold-bearing quartz 8 feet wide and panning from two to eight ounces has been opened up on the Ivory Coast.

RHODESIA.

From North Rhodesia the British Chartered South Africa Co. has received news of the discovery of a copper field estimated at 40 square miles. The field is situated 150 miles north of Victoria falls and runs thence to the Congo Free State. In the ancient mines dug by the natives, and reopened by engineers in the employ of the Chartered Co., assays of 44% are now being secured, besides a large percentage of silver. The Cape-to-Cairo Railway will be diverted to pass through the copper fields. Work on this section of the road has been accelerated, and it is expected that it will be completed early in 1903.

NEW SOUTH WALES.

The semi-annual report of the Broken Hill Proprietary Co. for the six months ending Nov. 30, 1901, shows the total output of silver to be 2,683,946 ounces fine, against 3,009,164 ounces for the previous half year, the price realized being 1 3/4d per ounce less; while the lead produced was 30,457 tons, against 27,869 tons, returning an average of 31s 11d per ton decrease on the prices obtained for the previous period. A reduction of 2s a ton in costs of ore treatment is announced, offsetting part of the loss by lowered sale price. The gross profit for the half year amounts to £56,293 1s 4d, which, after deducting £12,974 12s 7d for depreciation upon the various plants, leaves a net profit of £43,318 8s 9d. The sum of £34,243 10s 10d has been expended in construction. One dividend (131st) of 1s per share, amounting to £48,000, has been distributed.

Personal.

F. G. SEMMEK, of Salmon City, Idaho, is in Chicago, Ill.

J. L. BUTLER of Tonopah, Nev., is sojourning in San Francisco.

W. SWARTZ is manager of Santa Cruz M. Co. at Patagonia, Ariz.

J. S. SMITH is Supt. of the Jerome Canyon Copper Co. at Jerome, Ariz.

C. P. GRIFFIN has removed from Torres, Mexico, to Washington, D. C.

HENRY BRATNOBER of London and New York is in San Francisco, Cal.

W. J. RATTLE is superintending the Grand Mogul mine and mill at Silverton, Colo.

V. BARND, manager of the Tybo M. & Red. Co., of Tybo, Nev., is in Boston, Mass.

G. E. METZ, M. E., of Brooklyn, N. Y., is examining mines in Madison county, Mont.

E. MCCORMICK has been appointed manager Aberdeen Copper Co., at Lordsburg, N. M.

A. D. FOOTE of the North Star mine has returned from San Francisco to Grass Valley, Cal.

GEORGE MCGILLIVRAY, of Dawson, Yukon Ter., is sojourning at Weaverville, Trinity Co.

W. BIELEFELDT has been appointed Supt. Green Mountain M. & M. Co., at Silverton, Colo.

H. DORN of Cleveland, O., has been appointed Supt. Woodland M. Co., at Red River, N. M.

S. OSBORNE, of Frisco, Utah, has been appointed Supt. of the Horn Silver mine at that place.

C. KING of Kokomo, Colo., has been appointed foreman Juniata mine, near Breckenridge, Colo.

HARRY A. LEE, Colorado Commissioner of Mines, has returned to Denver from Charleston, S. C.

FRANK JANNEY has resigned the superintendency of the Con. Mercur gold mines at Mercur, Utah.

R. MITCHELL is in charge of the smelters at the Cananea copper mine at La Cananea, Sonora, Mexico.

C. K. MCCORNICK, O. P. POSEY AND W. H. BREVOORT of Salt Lake City, Utah, are in Paris, France.

J. W. DEANE, late of Aspen, Colo., is superintending for the Valley Leasing & Mining Co. at Leadville, Colo.

C. M. FUELLER, Denver, Colo., has gone to Mogollon, N. M., to make plans for a pneumatic cyanide plant.

F. M. FIELD is putting in a 30-ton cyanide plant at Virginia City, Mont., to treat the tailings from the Easton mine.

A. H. HAWKES, assistant Supt. Conrey M. Co., at Virginia City, Mont., has returned there from a trip to Boston, Mass.

G. Z. EDWARDS has been appointed Supt. and H. W. Fox foreman of the mill at the Con. Mercur G. M., Mercur, Utah.

CHARLES J. BUSH, assistant Western manager Canton Steel Co., Denver, Colo., is making a business trip through Arizona.

P. ESPINAUX, manager of the Ralston Divide mine near Michigan Bluffs, Cal., has returned to the mine from a sojourn in San Francisco, Cal.

A. B. RINGELING of Baker City, Or., has been appointed mill Supt. and J. Fletcher of Butte, Mont., foreman Royal mine, near Philipsburg, Mont.

J. P. EVANS, of the Colorado Iron Works, Denver, Colo., is at Picacho, Cal., directing the construction of the milling plant for the California King G. M. Co.

W. J. THOMPSON, who has been connected for some years with the Oriental Con. M. Co. in Korea, has returned on a visit to his home in Plumas county, Cal.

C. L. LANG has resigned the superintendency of the Mack mine at Big Oak Flat, Cal., and has accepted the same position with the Hazel Dell M. Co., near Sonora, Cal.

R. NAYLOR, of Salt Lake City, Utah, has gone to Peru to join the engineering staff attached to the Cerro del Pasco copper mines, now being exploited by American capital.

A. C. ELLIS is in San Francisco, Cal., as counsel for J. R. DeLamar in the contest before the Circuit Court of Appeals, involving zinc dust as a precipitant in the cyanide process.

A. H. MAYNE has returned to Park City, Utah, from an inspection of the zinc smelters at Iola, Kan. He says experiments are being made there to save the gold and silver in Western zinc ores.

EDWIN REYNOLDS continues the chief engineer of the Allis-Chalmers Co. In addition to his present position of assistant chief engineer, Irving H. Reynolds is appointed general superintendent of the Milwaukee, Wis., works.

C. T. DURELL has been appointed general manager Central Montana Mines Co., which is at present operating the Whiskey Gulch and Spotted Horse properties in Fergus county, Mont. Mr. Durell was formerly Supt. Spotted Horse mine.

G. NISBET, formerly of Oroville, Cal., returned to San Francisco, Cal., from Siberia, where he has been engaged for several years with the Exploration Co. of Northeastern Siberia, Ltd., in an unsuccessful exploration for gold-bearing beach sands similar to those at Nome, Alaska.

PRINCE KOUSNETZOFF of the Royal School of Mines in St. Petersburg is in Placer and Nevada counties, Cal., making a tour of the mines for the purpose of studying the quartz and placer mining methods and machinery used, for the purpose of reporting on them to the Russian Government.

Commercial Paragraphs.

THE Stirling Co. has about finished erecting 500 H. P. of Stirling boilers for the Shannon Copper Co., Clifton, Arizona.

THE Allis-Chalmers Co. are building a 60-stamp mill for the Tom Boy G. M. Co., in Savage Basin, near Telluride, Colo. The new plant will be next to and adjoining the old mill.

GEORGE ANTON is manufacturer of Star and Globe brands of miners' and drivers' lamps, at Monongahela City, Pa., and guarantees to supply the trade with "the best lamp yet offered."

DON PALMER, of San Jose, Cal., connected with the King Solomon mine, Calaveras county, took one and one-half tons of talcose ore to Denver, Colo., on which tests were made with pneumatic cyanide treatment by C. M. Fueller.

THE Board of Council of Columbiana, Ohio, recently through its fire committee decided to discard the common hose couplings and use instead the improved couplers known as the "Quick as Wink," made by the W. J. Clark Co. of Salem, Ohio.

MANAGER W. VAN R. WHITALL of Gilbert, Wilkes & Co., Coronado Bldg., Denver, Colo., reports the recent sale of a 600 K. W. Bullock generator and three cars of Wagner transformers; also, a 40 H. P. motor and other equipment to operate new perfecting presses of the Denver Post.

A DEVICE for holding in check quicksands in mines has been invented by L. P. Friestadt, 145 La Salle St., Chicago, Ill. The invention consists of plates of steel, grooved and made to join, each section fitting rigidly in the other and built up from bedrock to form a barrier to quicksand. The invention is called a quicksand shield.

A. M. SWAN, sales manager of the Henry S. Mould Co., Pittsburg, Pa., manufacturers of briquetting machinery, has returned there from a business trip lasting seven months, during which time he visited every smelter on the North American continent. His trip covered the United States, British Columbia and Mexico. Many of the large smelters are already using briquetting presses made in Pittsburg, and many orders were secured from other smelting interests who had not in the past made use of such machinery.

THE Goodman Manufacturing Co. of Chicago, Ill., manufacturers for the past thirteen years of a complete line of electrical mining machinery for use in bituminous mines, have recently associated with them, as mining engineer, S. W. Farnham of St. Louis, Mo., for many years engineer of the Missouri Pacific Railroad coal properties in Missouri, Kansas, Arkansas and the Indian Territory. Mr. Farnham has a wide experience in the development, equipment, organization and management of bituminous mines, and is prepared to advise and assist the customers of the Goodman Co., not only in matters pertaining to electrical equipment, but as well in those relating to ventilation, drainage, tipple equipments, etc.

MINING AND SCIENTIFIC PRESS.

Whole No. 2171.—VOLUME LXXXIV. Number 9. SAN FRANCISCO, SATURDAY, MARCH 1, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

State Mining Exhibits at the St. Louis Exposition.

World's fairs and national expositions do not lose their novelty by repetition, and a change of location centering the new fair in a fresh environment of population makes the advertising opportunities of the latest as desirable as those of the first one were. Western mining industry has been represented by exceedingly fine exhibits at each of the great expositions that have been held so far. The opportunity afforded by the St. Louis Exposition, the preparations for which are well under way, should not be passed by and neglected. All States should have at it a better exhibit even than they had at the other expositions. Undoubtedly all will improve on the exhibits they have made at the preceding fairs, and no State should retire behind the other in accomplishment.

The St. Louis Exposition is too near at hand to wait on the initiative of an appropriation by Legislatures, which may not meet till next January. It is possible to regard this as an advantage. A legislative appropriation always has a string of appropriators attached to it. It is regretable that the admission has to be made that the appropriators have in notable instances been the principal exhibit obtained by the expenditure of any State appropriation.

Whatever is done in the way of an exhibit of the metal mining industry, if it would be well and creditably done, must be done through the initiative of private enterprise, and there must be no delay in starting the preparatory work for it. At the best the time is short, and several months delay in starting would make satisfactory preparation practically impossible.

As to California, this is a matter in which the California State Miners' Association, by its proper officers, could very appropriately take the initiative. Some organization, authority and responsibility are essential. The Miners' Association has this scaffolding already set up for any legitimate service to the mining industry. Some of the officers have had experience with exhibition work that would be invaluable as assistance in guiding the paid staff of employes who must do the real work of getting up and installing the exhibit.

There is, it would seem, an opportunity for improvement in the plan and detail over preceding State mining exhibits. To begin with, there should be a definite expression of just what the exhibit was expected to accomplish for the industry—not glittering generalities, that sound well, but can not be fixed down at a particular point into a measure of dollars, but definitely declared purposes, which, accomplished, mean dollars of gain for the investment in the advertisement. Having formulated this initial declaration of definite, concrete purpose, plan the exhibit to its accomplishment along the shortest and most direct line. Eliminate and keep out anything that does not clearly contribute to it. At expositions people gather ideas by the eye. The mass of facts and ideas provided for consideration is appalling to the mind. It refuses to be selective under such a strain. The eye is always selective at expositions. Build, then, the exhibit for the eye, so that the eye shall grasp its purpose definitely, and, by all means, avoid the possibility of confusing the selective power of the eye.

A mere collection of specimens of minerals and of rocks is confusing to the eye of an exposition visitor in the direct ratio of its completeness and usefulness as a mere collection of minerals. A collection of machines in all the glory of polish, paint and stillness defies the eye of an exposition visitor to make a selective effort. Both spread over much floor space, are great, magnificent, incomprehensible and—deserted for the Midway.

Throw the mineral specimens and rocks together at one end of an operating machinery plant—built, if you please, of many of the separate machines—from the other end of which a stream of bright, shining gold is falling, and the eye of the exposition visitor is at once selective and sees, not the many species of minerals, nor the points of the engines, but an opportunity to get a stream of shining gold. The minerals are raw materials, the machines a means to a definite desired purpose, both are details; the essential thing the eye selects is that together they make an opportunity to get gold.

The visitor to the exposition wants to see opportunities to get gold. All gold mining offers such opportunities. Let the mining exhibit then show the opportunities and do not let it show anything else. Our owners of undeveloped mines want to sell them, our manufacturers of machinery want them developed so that they become a market for their products, the railroads want more people everywhere. They can all unite to pay for and make a business exhibition of the opportunities in metal mining for more people than now have them.

All concerned who take this affair up should do it as business, and, regardless of providing opportunities for a bread-and-butter brigade, put the management in the hands of men, big enough in mind to make the most out of the opportunity.

A Clean-Up of the Golden Horseshoe Mill, Kalgoorlie, West Australia.—(See Page 117).

Partial View of Smelter of Arizona Copper Co., Clifton, Arizona.—(See Page 114.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countriee in the Postal Union..... 4 50

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

☞ MR. GEO. S. SCOTT is now our Chicago representative, office 737 Monadnock Bldg., Chicago, Ill., and is authorized to transact business on behalf of the MINING AND SCIENTIFIC PRESS.

San Francisco, March 1, 1902.

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A PROPOSITION for the establishment of a U. S. branch mint at Manila, P. I., is reported to have behind it the powerful interest of the American S. & R. Co. The report is very probably correct. The establishment of a branch mint there is bound to add to the consuming market for silver. It was proposed and strongly advocated by this journal a year ago as a practical measure for assisting the silver mining industry. It would be entirely self-supporting from the start, and there should be no delay by Congress in providing for its establishment.

SOME ONE has been at the mental effort of comparing some totals of sale value of the metal production of the United States, as stated by the statisticians of the U. S. Geologic Survey for 1900, and has discovered that "gold's prestige is declining" and "metals not called precious are much more in demand." The discovery would be interesting if the fact were true. As it happens, the fact is not true. If such comparisons could be considered logical, and if the use of the word "prestige" were proper in such connection, quite the reverse would be true. Mining for gold is more and more becoming a preference among people who mine for profit. Silver, copper and lead are all produced as an incident to the mining of gold. That is to say, the gold in the ore, and not the other metals, is the inducement to mine. More and more are such mines being sought for. The first question of a proposed silver, copper or lead mining proposition is always, How much gold is there in the ore? Properly giving to gold a credit for the values of silver, copper, lead, zinc and even iron produced incident to the gold mining and crediting, the values of the other metals with the gold production of mines that would be mined for the other metals irrespective of the gold, and generally rearranging the produced values to the economic basis of the mines making the production, it will be found that the demand for gold production is far in the lead as the incentive to mining. Copper will follow gold and silver make a poor third. Statistics read by total figures alone are very frequently misleading. The real teaching of this form of knowledge can only be had when the original details are studied together with the totals. The fact of economic importance deducible from the statistics of metal production seems to have so far been totally overlooked. It is that the production of gold is now tending to lower the sale price of silver, copper, lead and zinc by increasing their production independent of the extent of demand. To consumers of these metals, therefore, the condition of the gold mining industry is a matter of importance, and its extension a positive benefit. All such comparisons as are implied by such phrases as "gold's prestige now declining" are absurd. As well might one say the importance of the blood in the human body becomes less as the solid tissues increase in mass.

Doing Things and Telling.

A bright mining engineer, who is in direct charge of several extensive mining enterprises, said, in response to a suggestion from the writer, that he make public some of the special kinds of practice that his experience and necessities had originated: "These special inventions or kinds of practice have cost me something and they are worth something. I know they are to me, and they may be to others similarly situated. Making knowledge of them public I am giving something that has value for nothing, and by making the knowledge common with my competitors I am making it less valuable to me. It seems to me unbusinesslike to follow your suggestion." The position of the speaker seems reasonable, yet it is certainly debatable if it really be the correct position, and in the writer's opinion it is not.

There are many bright minds at work on mining and metallurgical problems. What one finds can not in the nature of things remain long an individual possession. Another or others with a similar problem find the same thing—it may be at the same time, or it may be a little later—some one of the finders publishes the knowledge, for to all it is unlikely to have the same value. The one who tells, gets prestige—a something more substantial than mere recognition that a success gives. Prestige in mining or metallurgy has a commercial value. It is capital for the man who does and tells so others can do. It widens his field of activities by making known to more men his possession of one capability from which others always infer more capabilities.

Assuming that what one does in telling the new fact that becomes known to him, all others do; then the one who makes the common possession of all, his one new fact, receives in return the many new facts, which are the result of the cumulative work of all others, and which the one mind working alone would only gain laboriously, or perhaps never gain at all.

The one who gives must then gain in the giving, something not possessed before—prestige—and as well what all give to the common stock of ideas. This is the gain from doing and telling. Does the loss of temporary exclusive possession of the idea outweigh such a gain? The writer thinks it does not.

An English engineer who had the prestige which doing and telling had given him, in addressing a body of American engineers, expressed this same view. He said, "You American engineers, soon as you find something new that improves your art and cheapens your practice, tell the others, so that you are all, always working ahead from the same advanced foundation. It is the cause of the great success your nation has achieved in industry. You all work together as parts of the intelligence of one man."

ON another page I. S. Hallett of Silverton, Colo., in a paper written for this journal, gives the results of some original investigations in the lately developed branch of metallurgical science known as concentration. Mr. Hallett is in this line of work a specialist, and his data of experiments and the conclusions he draws from them should receive careful consideration from miners and millmen. It must also not be overlooked that the conclusions from the experimental work have been verified by his commercial practice. Concentration of valuable minerals from worthless gangue rocks, and the parting of minerals one from the other (making each after the parting commercially utilizable where before parting none or at the best only one was commercially utilizable), is, as stated above, a lately developed branch of the science of metallurgy. It is quite a different art from the ore dressing practice in which it originated. The latter provided many mechanical devices and appliances for which the later developed science is showing the preferable application to service. Mr. Hallett's investigations, for example, have not developed a new device, but have only proven a more efficient mode of use of an existing one. Incidentally, there has been more clearly defined the economic limits of use of other mechanical devices for concentration.

Mine Water Problem of Cripple Creek, Colo.

Cripple Creek district, Colo., mine operators are becoming convinced that they have a condition of mine operation that is countering their efforts to obtain absolute economy of operation. As their mine openings have of necessity been getting deeper, the mine waters have been rising into them in increasing quantity. Machinery and methods have been improved, and costs lowered by the improvements, but the condition of constantly increasing quantities of water and increasing heights of lift have been adding costs that, if they have not already, ultimately will take up all the other savings. In short, the mine operators find their economies have been with the spigot of the barrel and that the bunghole is open.

Other mining districts have had problems of mine drainage that individual mines have found too much for their resources. Ultimately they have solved the problem at the common cost or by collective action. Cripple Creek's mine drainage problem does not differ in its essential features from the mine drainage problems of the other districts. There is reason to believe, however, that a much more satisfactory and economical solution is possible of its particular problem than has been accomplished heretofore with the similar problem in other districts.

A scheme of drainage to provide for the mines of the district will require one or more main tunnels with many branches. It is known that the tunnels can be constructed at a rapid rate by well proven methods. It can be closely estimated in advance what the cost will be. There is no question but that the mines can pay this cost as it is incurred. The equitable apportionment of the cost to all the mines in proportion to the service that will be given by the construction can be made approximately in advance, and the correction of errors of estimation developed by construction can be provided for. It is suggested that the approximate volume of rock in the claims between the plane of the drain tunnel and the surface would be one element on which apportionment of cost could be based, and the time interval between beginning of construction and completing of it through the particular claim would be the other element.

The drainage scheme should not be made an investment for profit. Such an organization should be made of the mines for this special purpose that the flat cost of construction could be assumed by the several mines and written off in as a debit to the profit and loss account as being dead work construction. The use of the drain tunnels for ore transportation could be made by contract to pay a charge in proportion to that use which would be distributed to all the mines in the pro rata of the original cost of construction, and would be a credit against that cost. The benefit of mine transportation facilities afforded by drain tunnels is in the direct ratio of use made of them.

These lines are intended to be suggestive without being conclusive. The opportunity for the application of the essence of the community of interest idea is exceptional. Gold mining is not competitive. The interests served by the community of interest in draining Cripple Creek mines will always remain unaffected by metal market prices and trade combinations. The necessity and profit of a common drainage requires no demonstration. The fact that it will, if postponed now, be done ultimately, should operate against its postponement.

The beginning of a great work of this kind must be in an ascertainment of the facts. There would be nothing lost and very much would be gained if the operators of Cripple Creek mines should make a preliminary organization and provide the cost of such an ascertainment of facts, and with them the most perfect drainage project that can be devised. The cost of this, while in the aggregate a considerable sum, so divided will be a trifle to each mine or group. The mere doing of it would suggest such an added stability and permanence to the mines of Cripple Creek district that their market values would be raised. Better than this, it would bring the accomplishment of drainage nearer, by eliminating the uncertainties and indefiniteness incident to the absence of exact knowledge of the facts and the real figures.

Concentrates.

IT takes about one pound of coal to evaporate one gallon of water.

A TANK 16 feet in diameter and 12 feet high will contain 13,500 gallons.

ORE is a natural mineral compound that is commercially valuable, containing metal.

AIR adiabatically compressed to 600 pounds pressure would have a temperature of 1070° F.

THE weight of water in pounds that a 1-foot length of pipe will hold can be obtained by squaring the diameter of the pipe in inches and dividing by 3.

THE highest altitude ever attained by man was reached by Dr. Berson of Berlin, in a balloon, Aug. 1, 1901—33,500 feet. The thermometer recorded 40° F. below zero.

IN 1800 the price of lead in London was £21 1s 3d per ton. The highest price of lead in London during the nineteenth century was £35 15s in 1806; the lowest, £9 11s 6d in 1894.

GOLD DREDGING on the Snake river deposits has been done at costs as low as 5 cents a cubic yard. It is quite probable that some short runs have been made at costs below that figure.

IN the case of a dynamo a single belt will transmit approximately 1 H. P. for each inch in width when running at a speed of 1000 feet per minute. In calculating for speed allow 1% for slipping.

A DAM lower down upon a stream cannot retard the water in the tailrace of another dam higher up the stream, if the back water of the lower dam does not reach into the tailrace of the upper dam.

THE general rock formations of the free gold-bearing zone of Thunder mountain, Idaho, are said to be rhyolite, andesite and quartz porphyry, the largest, heaviest and most regular bodies being rhyolite and quartz porphyry.

TIN-LINED AND LEAD-LINED WROUGHT-IRON PIPE is made by pouring the melted tin or lead into the iron pipe. The makers say that the result is a union of the two metals that is not broken apart even when the pipe is bent.

ONE pound of charcoal heats seventy-three pounds of water from 32° F. to 212° F. One pound of anthracite coal heats seventy pounds of water in the same way, and one pound of dry wood heats thirty-five pounds of water the same.

AN advantage of a high speed engine over a low speed is the obtaining of a desired amount of work from a less size and weight of engine. A disadvantage with some uses is a loss of power in the gearing required to reduce the speed.

TO FIND the quantity of water elevated in one minute by a pump the piston speed of which is 100 feet per minute, square the diameter in inches of the water cylinder and multiply by 4, the product in the number of gallons per minute.

WHETHER 45% or 60% giant powder is best to use is determined largely by the ground. A 6-foot hole is average, though 8 and even 10-foot holes are sometimes drilled. A 6-foot hole will ordinarily take about ten sticks of giant.

POTASSIUM or sodium will take fire when dropped into water, and will hurn in the water. Potassium costs about $1.50 per ounce; sodium about 30 cents per ounce. Both chemicals are dangerous, and should be handled with extreme caution.

IN a water tube boiler there is 10 to 12 square feet of heating surface to one H. P. With a tubular boiler the allowance of heating surface is from 14 to 18 square feet to one H. P. The former is ahout 10% more economical and makes steam about twice as fast.

"COMMERCIAL RUBBER" is by no means pure. For instance, the "rubber" of which carriage tires are made is composed of 48.5% pure rubber, 5 4% .sulphur, 6.7% barytes, 7.6% litharge, 20.7% chalk, 9.1% talc and 2% lampblack. Zinc white is a usual adulterant.

A LARGE DEPOSIT of ore that assays show carries an average gold content sufficient, if recovered, to pay more than mining costs, without counting values in other metals, is always worth the cost of study and examination to determine if the ore can be commercially reduced.

IN New South Wales, Australia, the wages paid for skilled machinists average $10.84 per week; for electroplate finishers, $15 84; for coppersmiths, $15.60; for engineers, $15.84, and for brass moulders in the engineering trades (bench hands), $10.56; coppersmiths, $12.48, and engineers, $13.32.

AS to whether the outside rim of a wheel goes faster than the hub, the question is to he interpreted hy the meaning given the word "goes." If motion through the air is meant the rim of the wheel "goes" faster, as it has the same total forward motion as the hub and, additionally, a motion of rotation.

FOR the separation of lead from manganese, a solution containing about 0.2 gram of lead in 150 c.c. and not more than 0.03 gram of Mn, with 25 to 27 c.c. of nitric acid of specific gravity 1.42, is electrolyzed at 70° C. with a current of two amperes. The lead is completely precipitated as dioxide, free from manganese, in thirty-five to forty minutes. With larger quantities of Mn, fairly accurate results are obtained by adding 35 c.c. of nitric acid and a little oxalic acid to dissolve any precipitate of manganese dioxide, using a current of two and one-half amperes.

THE slopes for an earth reservoir dam should not be less than 2½ horizontal to 1 vertical, and it is preferable to have the water facing slope as much as 3 or 3½ horizontal to 1 vertical. A clay core made thick and compacted by ramming will prevent the starting of leaks and is to be preferred to sheet piling.

THE auriferous conglomerates of the Witwatersrand at Transvaal, South Africa, are practically composed of quartz, silicate of aluminum, iron pyrites, gold and silver. Copper is rarely met with, as also are arsenic and antimony, and this composition is the explanation of the great success of the cyanide process with these ores.

ROASTED SULPHURETS, where the sulphurets were pyrite, might be made the basis of a cheap paint. It would be necessary to grind them after the roasting, wash, and settle from the wash water the finer slimes. These slimes, after drying, could be mixed with a cheap grade of fish oil to make protective paint for rough wood work.

USUALLY in the case of a reservoir the accumulation of water in the reservoir while rising in the waste way is an element of safety to the dam, as it may delay the time of high water until its maximum flow is past; but when the stream continues for some hours at its maximum flow, the overflow of the earthwork is delayed, but not prevented.

IT is good mining practice to drift on a vein as far as the pay ore shoot is continuous. It may be good practice to drift on a vein where there is no pay ore but heading toward where a pay shoot is believed to exist. Such a question can only be decided at the mine by one skilled in the business of mining. A street opinion on it is worth what it costs.

TO CONVEY 480 cubic feet of free air per minute 3 miles to have a delivery pressure of 100 pounds per square inch would require a 4-inch pipe and the loss in pressure would be 10 to 12 pounds, which would require the initial pressure of compression to be from 110 to 112 pounds. In losing 10% in pressure a gain in volume is made and the actual loss of power is reduced to 3½% or 4%.

MINING and scientific progress therein can be greatly advanced by the intelligent fraternity of miners in furnishing individual ideas and experiences as contributions to the common stock of knowledge, and in no way can greater publicity be assured than by their appearance herein. "Everybody is wiser than anybody," and one's light is none the less for having aided in illuminating another's path.

MAGNESIA ORE is not a definite description. Assuming that magnesite, magnesium carbonate, is referred to, this mineral being common in California, the crude ore is used as a refractory furnace lining; and ground, it is used in paper making. The mineral mined in California has a limited local consumption. The supply that could be mined, if there was a considerable use of it, is practically unlimited.

IN the hand labor tools used in mining, the best grade of steel, the quality that makes the fewest trips to the blacksmith, is the cheapest. The aggregate cost of the labor and material used in keeping such tools in perfect working service is several times the first cost of the tools. A saving of 50% in the blacksmith work on them during their life is always a larger sum than a 50% addition to the first cost.

NATIVE COPPER occurs in a rhyolite tuff in the foothills on the western base of Mount Rainier, Pierce Co., Wash. The metal occurs in pieces the size of pin heads and in flakes. It is disseminated through the rock and shows freely on fracture surfaces. The percentage is small, but the quantity of the deposit is said to be large and easily mined. No sulphide or other minerals exist in the matrix of the copper.

ONE TON OF COAL is approximately equal for steam making purposes to four barrels of petroleum. No exact figure of equivalence can be given, as both coals and petroleums vary in efficiency. The approximate figures stated are based on both high-grade coal and high-grade petroleum. A ton of inferior coal might only equal three barrels of oil. In California the average coal and the average petroleum are equivalents in the ratio of 1 coal to 3.5 oil.

IN welding copper, the copper should be treated with potassium nitrate and a cyanide, after which it is welded to itself, or to iron or steel, in the same way that iron is welded in the ordinary forge shop. A clean fire of coke or charcoal and a temperature of the copper considerably below a white heat ensure the best results. A temperature above this makes the metal brittle in working, while one much below will not give sufficient fluidity to the flux.

A SIDE HILL DITCH is best constructed in two stages. First the grade of the top of the ditch is leveled off and the inside hank slope completed. Powder can he used to advantage in this. A row of holes is drilled down to the level of the grade and from 12 to 18 inches in front of where the inside hank slope will be. These are loaded so that on blasting the broken rocks and earth shall be thrown off of the grade. The grade is then completed with scrapers and pick and shovel work. After the grade is completed the ditch cut is made in it. Powder is here used carefully to avoid injuring the outside solid bank. Unless the material should be compact rock, plows and scrapers can be used to economize on the more costly pick and shovel work.

AT Freiberg in Saxony, the fumes from the ore roasting furnaces are conducted through a series of rooms or fume chambers to a mountain top 1000 feet or so above the works. Much of the valuable flume dust settles by gravity and hy condensation. In one of the chambers a spray falls through the gases purifying them of many acid gases. Notable amounts of arsenic and silver are recovered. Very little gold seems to be taken into the fumes from the furnaces.

IT IS STATED that the Pennsylvania courts have decided that land could not be taxed as oil land until a producing well had been opened. The suit was over taxes on a piece of land adjacent to an oil well, and which taxes were refused. The court held that the assessor could not look into the ground any farther than the ordinary mortal and therefore could not say whether or not there was oil underground. The principle of this doctrine would apply to a mine equally with oil wells.

A MAN can work out and shovel into a sluice box from 5 to 10 cubic yards of wet gravel a day. In practice the greater ease in working the gravel wet rather than dry is balanced by the greater weight handled. The height of the sluice box above the shoveling floor affects the quantity that a man can handle. A wheeled scraper, with two horses, will move an average distance of 75 feet about 150 cubic yards of gravel loosened by a plow daily. A wheeled scraper does cheaper work than a drag scraper, particularly in gravel.

THE effective head of a water power is the total fall or head of the water, measured from the surface of the water in the penstock to the center of the tip opening of the nozzle through which the water is discharged on the huckets of the water wheel, less the sum of the heads due to friction and other resistances to the flow of the water through the pipe and other conduits to the point of application. The effective head of a water power is that part of the total head which does useful work. It is the head that gives the velocity to the water jet.

THE Supreme Court of Arizona in Kinney vs. Fleming decided that in the location of a mining claim, a mine in the vicinity, mentioned by name in the location notice, will serve as the "permanent monument" required hy the statute, which states that the notice of location shall refer to some permanent monument to identify it, and also ruled that a location notice stating that "said claim is 1500 feet in length and we claim 300 feet on each side of the center of the discovery shaft for the full length of the claim," is sufficient to hold said claim.

THERE is no average duty to water in hydraulicking. The number of cubic yards moved to the inch deponds on so many special conditions that it may be only 1 cubic yard in twenty-four hours, or it may be 25 cubic yards in the same time. Top wash that contains little or no gold is washed with the least quantity of water that will move it. Bottom gravel that contains gold is given all the water required to thoroughly disintegrate it so that the gold settles out of it. Averaging conditions, estimates can be made for duty of the water anywhere from 2 cubic yards to 5 cubic yards to the inch.

THE difference of pressure of water in a power pipe line, between the pressure with no water discharging through the nozzle, and the pressure with water discharging through it, measures the loss of head by pipe friction and any other causes creating losses. To get the number of feet of head lost, divide the number of pounds difference of pressure by .434. The small pipes leading from the nozzle to the pressure gauge should so connect with it that no suction effect is created which would tend to reduce the pressure in the gauge, and the latter should be set at the exact height of the point in the pipe or nozzle at which it is required to determine the loss of pressure.

IN platting the strike lines of several veins to determine a possible intersection or junction, the line of strike must not be confused with the apex line. If a vein has other than a vertical dip the line of strike and the apex line will not coincide in direction on a hill slope. Too much must not be inferred from the projection of several strike lines showing a possible joining beyond the lines of exposed outcrops. They may not intersect, and if they do there is no reason for assuming that they will make a thicker or richer ore body. Where soil and float conceal outcrops of veins the use of water to ground-sluice the covering down to the bedrock is a cheap and efficient method of prospecting.

IN treating ore hy the cyanide process the cost of the chemicals consumed per ton of ore treated depends on the kind of ore it is, varying from 5 cents per ton on siliceous ore carrying free gold to $2 50 per ton on sulphides requiring fine crushing and slow leaching. So, too, the cost of handling depends upon the amount handled. To crush, fill and discharge will vary from 50 cents per ton in a large mill handling free-milling gold ore to $3 per ton in smaller mills handling harder material. It is impossihle to give other than approximate statement. One kind of ore going $2.50 per ton can be treated profitahly, while a different ore might assay $7 per ton and yet not give resultant profit of any kind when treated. As to the cost of plant, the first cost of a good 100-ton cyanide plant would approximate $60,000, though it could he made to cost $100,000.

Screen vs. Hydraulic Sizing.

Written for the MINING AND SCIENTIFIC PRESS by S. I. HALLETT.

Perhaps no branch of metallurgical science has increased with greater strides during the past ten or fifteen years than the art of concentration; the art of eliminating the heavier, less valuable constituents of the ore from the lesser, more valuable and heavier contents; the placing of the ores, owing to their peculiar situation and distance from the market, in shape by means of dressing, so as to secure a profit to the mine producing them.

The discovery of the stratifying table, the many types of which have been all evolved from the Rittinger table, placing the ore directly before the eyes of the operator in such shape that but little skill was required to attend to them, has been, perhaps, the greatest stride in the past ten years. This invention, perhaps, has done more to make the modern concentrating mill fool-proof than any other of late years.

Beyond all douht, the question of sizing, if not the most important, ranks second to the invention of these stratifying tables. The necessity of sizing the ore is so absolute that it is now denied by but very few people, and we will find, in traveling and examining mills, that the more exact the sizing is the more perfect is the concentration in every respect, both in the making of a cleaner concentrate and tailings with less valuahle material in them.

Heretofore the common practice has heen to use trommels, circular in shape and revolving for the coarser sizes; then, as the ore decreases in size, to classify the pulp by means of hydraulic apparatus, the principle of which has always been practically the same—that of allowing the pulp to drop through an ascending current of clear water and drawing the pulp off at various heights by means of syphons. Of course, the larger pieces, being the heavier, drop to the bottom, flowing off in one syphon, the next heavier being drawn off above these, etc.

It does not matter whether, as in the German meinecke, you draw off from three to five sizes with the one introduction of clear water, or, as in the different types of cone sizers, you draw off one size at a time, running the overflow to another cone, though this type is more objectionable than the meinecke, hecause of the continued introduction of clear water. It is easy to get water into pulp but very hard to get it out without losing values.

In all well regulated mills the overflow of the hydraulic classifiers is discharged into a spitzkasten or series of pointed hoxes, being drawn off from the bottom, the heavier settling first and the last heing the finest. Great losses are made with the spitzkasten in its discharge, it carrying the infinitely small particles of mineral in suspension. The greatest loss connected with a modern mill lies at the end of the spitzkasten—a loss that is highly accentuated by certain classes of crushing machinery and lessened by others.

The use of stamps in concentration tends to flour the softer mineral and put it in a state where it will take several hours for it to settle, which, of course, removes it from the chances of being caught upon any concentrating machine. The use of rolls lessens this tendency towards sliming, hut does not eliminate it.

Human ingenuity has never been ahle to thoroughly and ahsolutely settle the losses that arise from the overflow of the spitzkasten, though considerable of these losses may possibly be taken up by some scheme like that of the Elmore patent process for running these tailings through crude oil, that seems to catch the finer ore particles very much more than the harder quartz.

But I think that the problem down to the spitzkasten has been solved—that is to say that, by means of vibrating screens, the use of the classifier may he entirely eliminated from now on in concentrating mills. The mill recently built at Silverton belonging to the Silver Lake mines is thoroughly equipped with shaking screens from the coarsest size down to and including screens of 100 mesh. They are working in a perfectly satisfactory manner and entirely do away with hydraulic classification.

It is understood that 100 mesh means 10,000 holes to the square inch. It is of the finest kind of wire cloth. Material that will pass through it is finer than is usually used hy assayers in preparing ore for the furnace. It is understood, of course, that it is not desired in any instance to comminute the ore so finely; but it is well understood that, in grinding the bulk of the ore down to a satisfactory size, a certain proportion, in spite of all efforts, will be floured, and it is just as necessary that this finest product should be sized in order to do good work as it is on the larger sizes. Hydraulic sizing is not sizing—it is classification.

The laws governing bodies falling in still water are well understood, but the law governing bodies in an upward current of water under pressure can never he understood, because of varying currents and eddies that are inseparable from its use.

A general objection to this style of sizing or classification comes under the head, however, that very small bodies of ore will fall to the same plane, so far as syphons are concerned, as the larger bodies of rock of less specific gravity. By running this same ore over a screen, supposing the screen to do good work, this factor is eliminated, as the action of the screen is positive, and pieces must be of the same size in order to pass through the meshes. The fact that a piece of ore and a piece of rock are of practically and almost absolutely the same size renders their separation upon almost any kind of a table more easy and satisfactory.

The main objections to a sizing scheme in the past have heen: First, the clogging up of the screen; second, the life of the screen, and, third, its capacity. These, I can thoroughly and absolutely say, have been eliminated. While, as yet, it is not a perfect machine, it is infinitely superior to hydraulic classification in its results.

I do not care to go into the merits of the different screens on the market, as most of them, while perfectly fitted for dry work, are entirely unfit for wet

SHAKING SCREEN TEST FOR EFFICIENCY WITH DIFFERENTIAL MOTION.

No.	Between Mesh	and Mesh.	Screen Mesh.	Per Cent.	Screen Mesh.	Per Cent.	Incline to Foot.	R. P. M.	Length Stroke.	Spray Used.
1.....	16	20	20	11.8	30	83	4 inches	228	½ inch	Without
2.....	20	60	60	87	80	94	4 "	228	½ "	"
3.....	60	100	100	80	120	93	4 "	228	½ "	"
1.....	16	20	20	18	30	90	3 "	228	½ "	Spray
2.....	20	60	60	92	80	93	3 "	228	½ "	Without
3.....	60	100	100	70	120	83	3 "	228	½ "	"
1.....	16	20	20	25	30	90	3 "	205	⅞ "	Spray
2.....	20	60	60	88	80	94	3 "	205	⅞ "	Without
3.....	60	100	100	60	120	72	3 "	205	⅞ "	"
1.....	16	20	20	18	30	82	1½ "	205	⅞ "	Spray
2.....	20	50	60	85	80	87	3 "	205	⅞ "	Without
3.....	60	100	100	58	120	81	3 "	205	⅞ "	"
1.....	16	20	20	41	30	92	1½ "	228	½ "	Spray, sprinkle
2.....	20	60	60	80	80	86	3 "	228	½ "	Without
3.....	60	100	100	69	120	89	3 "	228	½ "	"
1.....	16	20	20	31	30	80	1½ "	150	1¼ "	Spray, sprinkle
2.....	20	60	60	73	80	80	3 "	150	1¼ "	Without
3.....	60	100	100	45	120	64	3 "	150	1¼ "	"
1.....	16	20	20	18	30	65	1½ "	150	1¼ "	Spray, sprinkle
2.....	20	60	60	60	80	74	3 "	150	1¼ "	Without
3.....	60	100	100	36	120	60	3 "	150	1¼ "	"
1.....	16	20	20	24	30	84	1½ "	205	⅞ "	Spray, sprinkle
2.....	20	60	60	78	80	89	3 "	205	⅞ "	Without
3.....	60	100	100	62	120	86	3 "	205	⅞ "	"
1.....	16	20	20	28	30	88	1½ "	228	½ "	Sprinkle
2.....	20	60	60	81	80	91	3 "	228	½ "	Without
3.....	60	100	100	74	120	89	3 "	228	½ "	"
1.....	16	20	20	26	30	88	3 "	228	½ "	Sprinkle
2.....	20	60	60	75	80	88	3 "	228	½ "	
3.....	60	100	100	66	120	82	3 "	228	½ "	
1.....	16	20	20	33	30	88	3 "	205	⅞ "	Sprinkle
2.....	20	60	60	76	80	89	3 "	205	⅞ "	
3.....	60	100	100	72	120	87	3 "	205	⅞ "	
1.....	16	20	20	24	30	82	3 "	150	1¼ "	Sprinkle
2.....	20	60	60	71	80	80	3 "	150	1¼ "	
3.....	60	100	100	54	100	80	3 "	150	1¼ "	

SHAKING SCREEN TEST FOR EFFICIENCY WITH ECCENTRICS.

No.	Between Mesh	and Mesh.	Screen Mesh.	Per Cent.	Screen Mesh.	Per Cent.	Incline to Foot.	R. P. M.	Length Stroke.	Spray Used.
1.....	16	20	20	24	30	94	3 inches	350	½ inch	Spray, sprinkle
2.....	20	60	60	44	80	74	3 "	350	½ "	
3.....	60	100	100	70	120	88	3 "	350	½ "	
1.....	16	20	20	28	30	91	3 "	300	¾ "	Spray, sprinkle
2.....	20	60	60	66	80	74	3 "	300	¾ "	
3.....	60	100	100	66	120	84	3 "	300	¾ "	
1.....	16	20	20	34	30	90	3 "	250	1 "	Spray, sprinkle
2.....	20	60	60	80	80	90	3 "	250	1 "	
3.....	60	100	100	68	120	88	3 "	250	1 "	
1.....	8	20	20	59	30	95	3 "	250	1 "	Spray, sprinkle
2.....	20	60	60	84	80	92	3 "	250	1 "	
3.....	60	100	100	60	120	76	3 "	250	1 "	
1.....	8	20	20	49	30	94	3 "	300	¾ "	Spray, sprinkle
2.....	20	60	60	76	80	84	3 "	300	¾ "	
3.....	60	100	100	68	120	82	3 "	300	¾ "	
1.....	16	20	20	40	30	94	3 "	400	¼ "	Spray, sprinkle
2.....	20	60	60	74	80	86	3 "	400	¼ "	
3.....	60	100	100	49	120	18				
	16	100	100	78	120	92	3 "	400	¼ "	
	60	100	100	70	120	86	3 "	400	¼ "	
					Above tests straight or flat screen.					
1.....	16	20	20	22	30	86	3 "	350	¼ "	
2.....	20	60	60	78	80	90	3 "	350	¼ "	
3.....	60	100	100	42	120	56	3 "	350	¼ "	
1.....			20	24	30	88	3 "	350	¼ "	
2.....			60	74	80	84	3 "	350	¼ "	
3.....			100	54	120	70				
1.....			20	20	30	84	3 "	350	⅓ "	
2.....			60	70	80	80	3 "	350	⅓ "	
3.....			100	44	120	66	3 "	350	⅓ "	
1.....			20	20	30	78	3 "	350	⅓ "	
2.....			60	64	80	72				
3.....			100	66	120	86				

SHAKING SCREEN TEST FOR EFFICIENCY WITH ECCENTRIC.

No.	Between Mesh	and Mesh.	Screen Mesh.	Per Cent.	Screen Mesh.	Per Cent.	Incline to Foot.	R. P. M.	Length Stroke.	Spray Used.
1.....	16	50	50	87	60	86	3 inches	150	1⅓ inch	Sprinkle
2.....	50	80	80	46	100	79	3 "	150	1⅓ "	
3.....	80	120	120	62	150	72	3 "	150	1⅓ "	
1.....	16	50	50	90	60	92	3 "	228	½ "	Sprinkle
2.....	50	80	80	67	100	93	3 "	228	½ "	
3.....	80	120	120	71	150	94	3 "	228	½ "	
1.....	16	50	50	88	60	93	3 "	360	½ "	Sprinkle
2.....	50	80	80	65	100	96	3 "	360	½ "	Spray
3.....	80	120	120	62	150	76	3 "	360	½ "	
1.....	16	50	50	91	60	95	3 "	380	½ "	Sprinkle, spray
2.....	50	80	80	72	100	98	3 "	380	½ "	
3.....	80	120	120	76	150	85	3 "	380	½ "	
					Above the jigs.					
1.....	Crude	3	3	73	5	95	4 "	225	½ "	Spray
2.....	3	5	5	37	8	90	4 "	225	½ "	"
3.....	5	8	8	48	10	68	4 "	225	½ "	"
1.....	Crude	3	3	80	5	96	4 "	225	⅞ "	Sprinkle
2.....			5	46	8	92	4 "	225	⅞ "	"
3.....			8	50	10	66	4 "	225	⅞ "	"
1.....	Crude	3	3	87	5	98	4 "	225	1¼ "	Sprinkle
2.....			5	42	8	89	4 "	225	1¼ "	"
3.....			8	67	10	93	4 "	225	1¼ "	"

work; but the principle that must he followed to insure success is the one that can he tested hy any one who has a fine screen and will place rock upon it, and that is that if a screen be moved at any angle and the screen be stopped suddenly hy any kind of a hump, the ore lying on the screen will follow the direction from which the hlow is given, and that, in order to keep the screen meshes clear, the hlow must be delivered at a point so as to drive the ore from the screen upwards. In other words, the screen having heen stopped, the momentum of the ore will go towards the direction of the hlow. This can easily he tested hy placing the screen at an angle and striking it, when the effect can he ohserved. As in the old humping table, it can be made to climh up grade hy striking it at the tack. By making the screen strike at its end, a forward motion is imparted, but this will ahsolutely clog the machine to a very great extent, and is not the blow that is desired.

The hlow that I am using is delivered at an angle of 45° to the pitch of the screen, giving it an upward and forward bump at one and the same time.

This machine is being used equally well on dry work of the coarsest material, as well as on ore down to the size of 100 mesh. It does its work perfectly and can he seen at any time in the Animas mill helonging to the Silver Lake mines, at Silverton, Colo.

The wear of the wire cloth will undoubtedly he excessive, but I am assured hy the manufacturers that they can manufacture brass perforated down to 100 mesh, which will solve all questions as to the wear of the screen cloth.

One curious fact in connection with this extremely fine sizing is that the capacity of the screen is regulated hy its width and not by its length.

There are many screens upon the market—the Jeffrey screen, the screen now heing put upon the market hy the Colorado Iron Works of Denver and many others—each and all of them having some good points.

I enclose a statement of some experiments that are not yet complete—one giving a tahle of my experiments with shaking screens operated with differential motion, another of the same screen operated hy eccentrics. I regret that my tests of the latest screen introduced into our mill, which is actuated on the principle of the bumping tahle, which seems to he superior to others, are not yet finished.

In these tests I have tried the following way:

According to test No. 1, ore that has passed through a 16-mesh screen and stopped on a 20-mesh screen has the percentage marked hy the per cent. I have then gone further and tried the material that would pass through this 20-mesh screen and, hy hand work, have further tested its efficiency on a 30-mesh screen, and the table likewise gives the efficiency in the percentage of result that will stay upon a 30-mesh screen, together with the inclination of each foot of the screen, the revolutions per minute of the motive power, the length of the stroke and with or without spray.

The product passing through the 100-mesh screen is fed directly to a spitzenkasten and is eminently suited to it.

EL COPETE, URES DISTRICT.

El Copete Camp and Smelter, Ures, Sonora, Mexico.

The El Copete mines, in Ures, District of Sonora, Mexico, were worked in the seventeenth and eighteenth centuries hy the Spaniards, who sought only the gold in the ores, paying little if any attention to the copper. They followed the rich gold-hearing streaks in the ore hodies, leaving hlocked out in the mines thousands of tons of rock which were very rich in copper. By modern methods of reduction those ores left in the mine are also worked for hoth the gold and copper. The "antiguas," as the old Spanish workers are called in Mexico, sorted on the dumps the ore they extracted, taking only the richer, and leaving on the dumps thousands of tons of ore which are workahle now at a profit.

The operation of these mines hy the Spaniards was ahandoned at the time of the great Apache uprising, in the heginning of the nineteenth century. In 1881 they were taken up and worked for their gold hy J. J. Hardwick. In 1896 Mr. Hardwick and some associates of Phœnix, Arizona, and New York organized the Copete and Melczer Mining Companies, to work the mines on a more extensive scale for hoth gold and copper. A copper smelting furnace, with a daily capacity of 250 tons of ore, was huilt and started into operation May 6, 1901. A concentrator, it is stated, is to he added to the plant.

El Copete is situated ahout 25 miles eastward from Carho station, on the Sonora railway, and the Melczer Mining Co. has a concession from the Mexican Government to huild a line of railway connecting the camp with the railroad at Carho.

The Copete M. Co., an American corporation, is the operating company, holding the stock of the other corporation, in which the titles are vested. The officers are: W. Melczer of Nogales, president; W. S. Logan of New York, vice-president; and J. J. Hardwick of Phœnix, general manager.

COPPER SMELTING FURNACE, EL COPETE.

Operations of Arizona Copper Co., Clifton, Ariz.*

[STAFF CORRESPONDENCE.]

Within the last eight months the old smelter of the Arizona Copper Co., Clifton, Ariz., has heen supplanted hy an entirely new plant, with the most modern facilities for work. The new plant has four rectangular furnaces, each 20 feet by 3 feet 3 inches, water-jacketed, and each with a 50-foot stack leading into the dust chamber, 60x30 feet in size. The latter opens into a tunnel 480 feet long, on a 2% grade, into the mountain, to the hase of a shaft that rises vertically 380 feet to the surface. Each furnace has a capacity to handle 250 tons charge per day. The molten material discharges from the furnaces into square settlers, is thence conveyed to reverheratory furnace, thence to 5-ton ladle, from which it is carried by the electric crane to the converters. The slag skimmed off the converters goes to the charge again as a flux. There are ten converters, three heing in use at a time. The charge is made up of sulphides, oxides, carbonates, flue dust, concentrates and hessemer slags. The plant includes three concentrating plants at Clifton and one at Longfellow, near the mine of that name, by which ahout 27,000 tons of ore are concentrated every month, ahout 5000 tons heing smelted crude. The milling process is one of concentration and reconcentration. The carhonate ores of low grade are concentrated separate from the sulphides and the tailings from the former are suhjected to the leaching process, the plant for which includes acid works. The tailings from sulphide ores are reconcentrated, then smelted. The company has two mining centers, one at Longfellow, the other at Metcalf. About 70% of the ore tonnage comes from the former and 30% from the latter group. The most of the sulphides come from the Longfellow. Manager James Colquhoun states that the property is producing ahout 13,000 tons of copper per annum, and that the ores run ahout 4% copper. Operations here are systematized to handle a large tonnage at the minimum cost and to make the closest possible saving of values. The company's railroad, operating between Clifton and Metcalf, is now 36-inch gauge and hauls the ore to the smelter at a very low cost per ton. It will soon be hauling the ore of the Shannon Copper Co. also. The Arizona & New Mexico Railroad, from Clifton to Lordsburg, is virtually a part of the property of the Arizona Copper Co. It has heen made standard gauge and gives excellent train service. The same line is being extended from Lordsburg to a point on the El Paso & Southwestern.

*See illustration on front page.

THE following quotation is taken from a recent work of the director of the psychological laboratory at Yale University: "Although a frog jumps readily enough when put in warm water, yet a frog can be hoiled without a movement, if the water is heated slowly enough. In one experiment the water was

heated at the rate of .0036 of a degree Fahrenheit per second; the frog never moved and at the end of two and one-half hours was found dead. He had evidently been boiled without noticing it." At any point of time the temperature of water was in such little contrast with the temperature a moment before that the attention of the frog was never attracted to the temperature of the water at all; so the frog was actually boiled to death without knowing it.

The Treatment of Clay Slimes by the Cyanide Process and Agitation.*

NUMBER III.

By E. A. H. Tays and F. A. Schiertz.

Lime.—Half an hour before stopping the agitation 5 pounds of slacked lime was added per ton of slimes in the charge. Many tests were made with amounts varying from 2 to 15 pounds per ton, but we finally settled on 5 pounds as a safe mean. That the addition of lime is necessary to produce settling will be seen later. That it affected the solutions by vitiating our titrations has been shown. We fully demonstrated that, whether the lime was added at the beginning or near the end of the agitation, it made no difference in the settling.

In the old treatment of the sands so much trouble was given by foul solutions that every few months the solution on hand had to be thrown away. We were never bothered in this way throughout the whole run of eleven months on slimes, and we attributed this result to the use of lime, which undoubtedly slimes can be obtained with a charge not exceeding promoted settling and neutralized the acidity of the slimes.

Settling.—After the charge had been agitated five hours it was allowed to settle seven hours. In this part of the process we made many experiments and were kept continually on the alert in order to obtain the best results, since upon good settling depended the whole success of the treatment. Our aim was to secure a settling that would allow us to decant at least 70% of the solution perfectly clear. We found lime absolutely necessary with charges that were proportioned at less than 4 solution to 1 slimes. A charge consisting of 10 tons of slimes and 20 tons of solution to which lime was not added had not settled 1 inch at the end of two hours. A large sample of this charge was taken after agitation had been started, and experimented upon by the addition of water. When the proportion of 1 slimes to 4 water was reached settling was rapid. Acting on this hint, we made the charge 1 slimes to 3 solution and added 7.5 pounds lime per ton of slimes. This, after agitating one hour, was allowed to settle, with the following results: In one hour it had settled 5 inches; in two hours, 10 inches; in three hours, 12 inches; in four hours, 13 inches; in five hours, 13.5 inches; in six hours, 14 inches; in seven hours, 15.5 inches, and in eight hours, 16 inches.

In practice it would tax any plant to handle the volume of liquid that 1 to 4 would produce, which, with the "wash," would be nearly 6 tons of solution for every ton of slimes treated, but with the judicious use of lime as good settling as can be got from clay 3 solution to 1 slimes. But 25% of sand slimes in the charge would make a great difference. Material of that character should not need more than 2.5 solution to 1 of slimes.

We found that the pure clay slimes charge at 1 to 2 would not settle even when 20 pounds of lime to the ton of slimes had been added, but when the charge was made 1 slimes to 3 solution the settling was rapid. As has been stated, our regular charge, where we used a mixture containing not more than 75% of clay, was 1 slimes to 2.8 solution, although at times we had to raise this to 1 slimes to 3.4 solution, even when lime was used. Even when the clay slimes settled it was not very rapidly. In the seven hours allowed they would only settle 17 inches, whereas the clay slimes (70% clay) would settle from 22 to 24 inches in the same time. At the former rate of settling but 81% of the values actually held in solution could be decanted (two decantations, as will be seen, being made from each charge), while the latter rate gave 91% decanted—a difference to be appreciated.

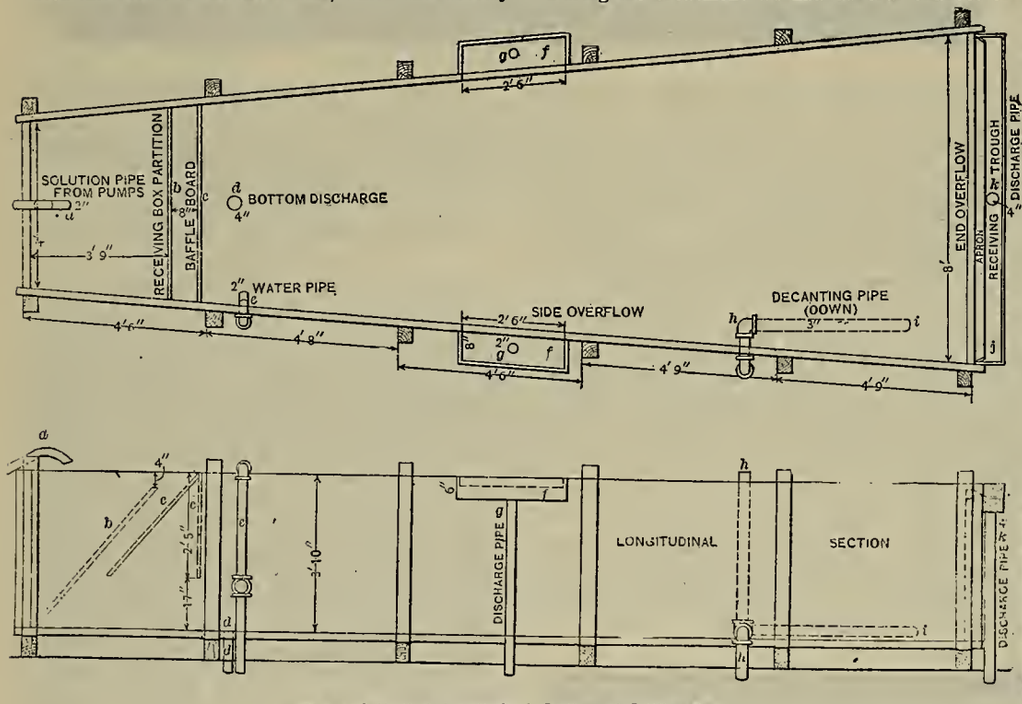
During the greater part of the run, when we had our average character of material, the charges would deposit as much as 12 inches during the first hour. These charges would begin settling from the moment the agitators were stopped, often settling 0.25 inch by the time the charge ceased going around.

During the last three months of the run a charge would rarely settle over 6 inches during the first hour, and often not more than 4 inches. Even at this slow rate the settling would reach 19 inches, as a rule, inside of the seven hours allowed.

The records of settlings from tests made at different times may be of interest (see Table V).

During the treatment we had several chances of testing the settling rate for thirty consecutive hours.

The difference will be noted in the rate of settling in the different tanks at the same time:



Plan and Vertical Longitudinal Section of Settling Box.

TABLE V.—Tests of Settling With Lime.

Test made April 18, 1900—Charge: 1 slimes to 2.5 solution. Slimes, 10 tons; 15 pounds of lime to 1 ton slimes added as soon as charge was in.

Settling	
Hours.	Inches.
0.5	3.75
1	5.5
2	10
3	15
4	18
4.5	19

Decanted clear, 62.5%.

Test made April 21, 1900—Charge: 1 slimes to 3 solution. Slimes, 5 tons; 20 pounds of lime added per ton of slimes.

Settling	
Hours.	Inches.
1	5
2	10
3	12
4	13
5	13.5
6	14
7	15.5
8	16

Decanted clear, 85.33%.

TABLE VI.—Rate of Settling in Different Tanks.

(Test made Marcb 1, 1901—Charges Nos. 1022 to 1026. First settling 31 hours, second settling 6 hours.)

Tank No.	First Settling. Inches.	Second Settling. Inches.
1	29.50	24.50
2	20.00	24.00
3	20.00	25.30
4	28.50	23.00
5	25.50	22.50
Average	28.99	23.59

Total extraction of values held in solution by two decantations, 91.6%. Ordinary decantation at the time, 86.3%.

This run was on our most favorable material—that containing at least 25% of sand slimes, and the charge was made up of 10.878 tons of slimes and 27.158 tons of 0.15% KCy solution, making the proportion 1 slimes (wet) to 2.5 solution, or (moisture being 17.6%) 1 slimes (dry) to 3.25 solution. In the first settling 5 pounds of lime per ton of slimes was added, and in the second 2.5 pounds per ton. Unfortunately, the test sheet was lost, but the second settling shows that the first had deposited at least 24 inches in the seven hours usually allowed.

TABLE VII.—Rate of Settling in Periods of Three Hours.

(Test made May 2, 1901—Tanks settled for 30 hours, rate taken every 3 hours; material of the worst clay, nearly all clay slimes containing, in the driest and hottest month in the year, 19 2% moisture, after having lain exposed for 5 years. Charge, 1 slimes (dry) to 3.3 of 0.15% KCy solution. Lime added, 5 pounds per ton of slimes.)

Hrs.	Tank 1 In.	Tank 2 In.	Tank 3 In.	Tank 4 In.	Tank 5 In.	Tank 6 In.
3	11	12	10.5	7	6	7.6
6	16.5	16	17	16	15.5	10
9	29.5	19.75	19	14.75(?)	15.25	12.5
12	22	18(?)	19	20	16.25	13.5
15	24	20	19	19(?)	19	15
18	24	22	23	21.5	19.5	15
21	23.5(?)	22	23	21.75	19 5	15.5
24	23.5	22.5	23	21.75	20	15.5
27	24.5	22.5	24	21.5	22.5	16
30	24.5	24.5	24.5	23	23.5	18

At seven hours tank No. 1 had settled 19 inches. Tank No. 2 had but two-thirds the regular charge. In decanting tanks settled 0.5 inch more.

Table VIII represents our worst work. Considering the material, the wonder is that it could be made to settle at all, with a reasonable proportion of solution.

TABLE VIII.—Rate of Settling for Thirty Hours for Each Hour.

(Test made June 27, 1901)

Hrs.	No. 1. In.	No. 2. In.	No. 3. In.	No. 4. In.	No. 5. In.	No. 6. In.
1	3.5	3.5	4.5	4.5	4.5	2.5
2	6.5	9	13	10	7	7
3	14	16	17	14	15	9.5
4	17	18	18	15	16.5	10.5
5	18	19	18	16	17.5	11
6	19	19	19	17	19	11.5
7	19	19	20	17	20	12.5
8	19	19	21	18	21.5	13
9	19	19.5	21.5	19.5	21.5	14
10	19	20	22	20	22	14
11	20	22	22	20	22.5	14
12	21	22	23	20.5	22.5	14.5
13	21	22.5	24	20.5	22.5	14.5
14	21.5	23	24.5	20.5	22.5	14.5
15	22	23.5	34.5	20.5	23	14.5
16	22	23.5	24.5	20.5	23	15.5
17	22	24	24.5	20.5	24	16
18	22	24	25.5	22.5	24.5	16
19	22	24	26	23	25	16.5
20	22	24.5	26	23	25	16.5
21	23	25	26	23.5	25.5	16.5
22	23.5	25.2	26.5	24.5	25	17
23	24	25.5	27	24.5	26.5	17
24	24	26	27	24.5	26.5	17
25	24.5	26	27	24.5	26.5	17
26	24.5	26.5	28	34.5	26.5	16.5
27	24.5	26.5	28	24.5	26	16.5
28	25	26.5	28	25	26.5	e7
29	25	26.5	28	25	26.5	17
30	25	26	28	25.5	27	17

These charges consisted of at least 80% pure clay and were made up of 1 slimes (wet) to 2 87 solution. The slime charge was 9.914 metric tons (1000 kilos) containing 16 9% moisture. This would reduce the dry metric tonnage to 8.238 (9 tons avoirdupois), which would make the charge 1 slimes (dry) to 3 6 solution. Even at these proportions the nature of the material was such that settling was very poor, barely 50% of the solution being decanted clear after seven hours' settling, with the addition of 5 pounds of lime per ton of slimes.

Decantation.—After settling seven hours the clear solution (from 14 to 18 tons) was decanted. This usually took about an hour and twenty-five minutes. At first we drew off the clear solution through a double row of 3-inch holes set in "criss-cross" order for about 3 feet up the side of the tank, but by reason of the irregular settling we soon found that this would not do, since we often had to leave a couple of tons or more of clear solution in the tank. At the suggestion of our machinist we then ran through the side of each settler, about 1 foot from the bottom, a 4-inch pipe, connected it by a loose elbow at the inside end with a 3.5-foot length of pipe, set out of reach of the arms, and kept vertical while the charge was in agitation. After settling had taken place the standpipe was let down gradually into the clear solution, until this was decanted down to the slimes. The 4-inch pipes from all the settlers discharged into a receiving tank set on the floor below the agitator level. While 80% of the solution would run off very rapidly, the last portion (say 3 or 4 tons) drained off very slowly, and with it would come more or less fine slimes, which subsequently made trouble in the zinc boxes—not by hindering precipitation, but by the increasing bulk of the precipitates and interfering with their reduction to bullion. To overcome this difficulty we put over the two gold storage tanks a large settling box, which will

Trans. American Institute Mining Engineers, Mexican meeting, November, 1901.

be described in its place. (See illustration.) From the receiving tanks the solution was pumped up to this settling box, whence it ran to the gold solution storage tanks, and thence to the zinc boxes.

When all the clear solution from the first charge had been decanted, water was charged (agitation having been started again) in equal amount to the solution decanted, and the agitation was continued one hour, or for about fifteen minutes after the wash water had been charged. We used water mostly as a wash, but when we had an excess of weak solution (that which had been through the zinc boxes) we used it as a wash or second solution. As soon as the wash was charged 2.5 pounds of lime per ton of slimes was added. This was not needed in all charges, but to make sure it was added, as it could do no harm. After agitating one hour, as stated, the charge was allowed to settle six hours, when the clear solution, usually in amount equal to the first decantation, was decanted in the manner already described.

Water was then added to the charge, in solution, until it was thin enough to run, when it was discharged through a 4-inch opening in the side.

(TO BE CONTINUED.)

The Story of the Nome Gold Fields.

Written for the MINING AND SCIENTIFIC PRESS by OTTO HALLA.

In calling your attention to the gold fields of Nome let me briefly give you the history of the gold fields. During the Klondike excitement in 1898 several expeditions started for Kotzebue sound, rumors among the whalers being to the effect that gold had been discovered and mined there by deserters from the crews. Among other vessels the bark Alaska sailed from San Francisco in June, 1898, with several scores of men—adventurers—bound for Kotzehue sound. Among the crew was an adventurous tailor, Erick Lindbloom of Berkeley, Cal., a Swede by birth, who, like many others at that time, had formed a determination to go to the Arctic gold fields at any cost. On the trip north the bark touched in Port Clarence harbor to take on a fresh supply of water. Lindbloom, who was not much of a sailor, went ashore to assist in getting the water and took the opportunity to desert. As soon as he came ashore he struck out for the hills and hid in the huts of some natives. Lindbloom did not show up until after the departure of the Alaska. Although he was apprehended by the revenue cutter Bear when he came to buy some provisions, he was soon liberated by her officers. This was in July of 1898. He visited the Swedish missions where Teller City now is, and then struck out on the creeks until he found some prospects. He then went to the mission on Golofnin bay and met a party of prospectors and several of his countrymen, among others Lofet Lindberg, a United States Government reindeer herder. The latter deserted his charge and with another Swede—John Brynteson, also a Government reindeer herder—joined Lindbloom, Missionary Anderson and a prospector named Price. Lindbloom confided his discovery to them and under the leadership of Price they started in Octoher, 1898, to stake the ground. They formed a mining district, elected a recorder and appropriated several claims on the creek, which they named Anvil creek. The news of the discovery soon spread out and the few people who were within a distance of 100 miles commenced to arrive. News of a gold strike travels fast and the report of the discovery was sent to the outside by the transportation and trading companies in St. Michael.

With the opening of navigation in June, 1899, a rush of people arrived from all parts of Alaska and also from the States. In June after the first day sluicing was done on Discovery claim and the amount of $9000 was taken from the boxes that day the magnitude of the discovery was appreciated. In July the beach diggings were struck. People with rockers could make from $15 to $200 per day, and in some instances even more. The town of Nome started into existence and by the closing of navigation in 1899 had grown to about 4000 population. Several new finds were made on Snow gulch, Glacier and Dexter creeks, Solomon river, Big Hurrah, Ophir creek, Elkhorn creek, Cripple river—all of which have proven to be paying properties. The output of gold dust in 1899 was calculated to have been $1,500,000.

On the opening of the season of 1900 a new discovery was made on the beach near Top Kock point. On a stretch of 200 feet square, within three weeks, about $500,000 worth of gold dust was taken out with rockers; finally the pay was traced to Daniels creek, which since has produced a large amount of gold dust. Anvil creek and other creeks were opened up on a larger scale, and it is estimated some 20,000 new arrivals came into the district. Litigation was started, which has retarded the progress of the country to a great extent. Mine owners became fearful of opening up their claims, owing to the dangers of litigation. The output of gold during the year 1900 was officially put at $5,500,000. The creeks producing were Anvil, Snow, Dexter, Daniels, Ophir and Salomon river and Nekkla gulch. In the fall of the year a new discovery was attracting some attention on Gold Run, a tributary of the Blue Horse and also the Kongrock. On the strength of this discovery a new town, Teller, was started in the Port Clarence harbor, and a little boom was enacted during the winter season of 1900-1901.

During the winter season of 1900-01 some prospecting was started on the hillsides and benches off Anvil creek, Bourhon creek, Newton and Nekkla gulches, which indicated that good pay and large returns would he derived from benches, which up to this time had not been taken into account. The fuel question was a great drawhack to more extensive prospecting during the season. There was not coal enough on hand to supply the demand of the town of Nome, in fact coal was selling at from $75 to $100 per ton; it was a prohihitory price for prospecting with a steam thawer. Nevertheless the results of the prospecting that was made was satisfactory. One claim on Newton gulch worked by three men in the winter season produced $45,000; one claim, the Mattie on Nekkla gulch, produced $65,000. Several claims on Bourhon creek yielded from $4000 to $12,000; a claim on Martin's creek $2000, being the work of one man. Benches on Ophir creek produced from $30,000 to $40,000, all winter work in a very severe winter, with a large amount of snow retarding all development work. The season of 1901 opened up very late, in fact not before the middle of July. During the summer season of 1901 the older claims were worked and a few new discoveries made, principally on benches. The Anvil creek henches were proven to he more extensive in auriferous gravels than the creek hed. On a hench on Dexter creek (the Sugar claim) a hody of pay gravel 70 feet deep has been uncovered. On Glacier creek the Mogolan claim has proven to be a rival in richness to Discovery claim of Anvil creek. It has been demonstrated hy the work of 1901 season that the largest auriferous gravel deposits are to he looked for in the old channels of ancient rivers, which have been covered up hy slides and are now crossed hy the present creeks and gulches. Late in the season two hig nuggets were found on Discovery hench of Anvil creek worth $1050 and $1750 respectively.

The closing of the season has stopped the work till the summer of 1902, hut there seems no doubt but that developments have hardly been hegun on the greater gold fields of Nome. The output for the season of 1901 was put officially at $4,500,000.

A numher of new large scale enterprises were started up during the fall month of 1901. A ditch 10 miles long has been completed to Snow gulch and Discovery claim on Glacier creek. Hydraulic machinery was installed hy Leland, Davidson & Bliss on Snow gulch and Glacier creek. A hig steam shovel at a cost of $100,000 was installed on Solomon river by the Colorado & Minnesota M. Co., and gravel in the ordinary river channel, which averaged $2.50 to $3 per cuhic yard, was worked. A new discovery was made during the fall of 1901 on Condel creek, a trihutary to the Keevalik, emptying into the Good Hope bay. The creek promises to he a paying proposition. Enough gold has been taken out from the stream to induce several storekeepers to open up trading posts at the new town of Deering at the mouth of Keevalik last fall.

With the heginning of the winter season of 1901-02 a wide activity was noticable. All of the old discarded steam hoilers which were brought in with the great rush were put into good condition and work was projected on several benches in the Nome district, Kougrock, Bluestone and Solomon river districts.

The insecurity of title and the undeveloped condition of the mining which tended to retard the investment of capital in the first few years have now been changed to conditions where titles are secure and successful developments made. There are now opportunities for investment in mining that at least equal what can be found anywhere in the world. Especially is this the case for investment in ditches and hydraulic machinery. Actual prospecting has demonstrated that 50% of all the trihutaries of Snake, Nome, Cripple, Solomon, Neukluk, Pilgrim, Smoot and Top Kock rivers carry auriferous gravel in more or less paying quantities, covering an area of about 1000 square miles, which it will require years to work out. Ditches, hydraulic plants and, in many instances, long flumes to dump the tailings are required. The rivers in the Nome gold fields are particularly adapted for extensive and profitahle hydraulic mining, for the reason that during the snow thaw or any rain storm the small creeks and gulches become full of water and torrential.

To form an idea of the extent of those rivers and the gold deposits, the dimensions of the principal ones will illustrate. The Snake river, with its hends and curves, is about 25 miles long, having auriferous gravel from the mouth of Gold Bottom to its inflow to the ocean. The Nome river is 35 miles long, with many paying creeks as its tributaries. At the head are the Dorothy, Clara, Cbristian, Sulphur and Hobson, forming very extensive bars, all of which have proven to he paying. Then at the lower part are Dexter, Buster, Extra Dry and Lost creeks as its trihutaries, known to he of great value. Oshorn creek has pay in many places, as far as prospecting demonstrates. The Solomon river, 20 miles long, has the hest paying bars discovered in the district; hesides, the benches helow Shovel creek are known to produce from $30 to $40 per shovel per day, sluicing. The Cassa de Pago river is ahout 40 miles long, with very good paying trihutaries—Willow, Ruby, Goose, Quartz, Banner, Spruce, Penelope and Canyon creeks—all of which have contrihuted towards the output of gold. The Neukluk river is about 40 miles long, and has trihutaries—Ophir, Elkhorn and Camp creeks—of which Ophir has hars. The Cripple river is 20 miles long and its tributaries are Hungry and Oregon creeks and Nugget gulch, all of which have been worked since 1900. On Hungry creek an old rocker and a silver coin were found huried under 6 feet of gravel, clearly indicating that that creek was worked many years ago. The Sinook river is 45 long, with many paying trihutaries. All of these rivers will have to be ultimately worked on an extensive scale, either hy hydraulic means or steam shovels. There is easily opportunity for twenty or more independent hydraulic mining companies. At present there are existing several ditches, the principal one heing that of Leland, Davidson & Bliss, from the head of Glacier creek to Snow gulch and Discovery claim on Glacier creek. This ditch carries ahout 300 inches of water, is 10 miles long, and was made at an expense of $1000 per mile. The operators made within two weeks after starting to work a net profit of $40,000 after paying all expenses and royalty to the claim owners. They have commenced work on an extension of the ditch to Hohson creek, 15 miles distant, will get at least 1000 inches of water and will be ahle to work all the trihutaries to Snake river. Another ditch was started at the mouth of Oshorn creek hy Snyder & Co. C. D. Lane has commenced a ditch at the head of Ophir creek. There is a ditch in course of construction from the Scooschihlock, to convey water to Daniels and El Dorado creeks, at an expense of at least $50,000. The steam shovel on Solomon river is the forerunner of three more to he installed at the same place. The average dirt handled is $2.50 to $3 per cuhic yard. There are two hucket dredgers in operation on Solomon river.

Inlet to Pipes from Head Boxes.

TO THE EDITOR:—A pipe should ordinarily he connected with the head box from which it is filled hy a cone-like taper section. This is not always necessary, as it appears from following reason: I suppose a pipe of diameter d and slope s, heginning at a depth h helow level of water in head hox. The velocity of water in the pipe v is given hy proper tahles for d and s, and is often very low.

On the other hand the height h produces a velocity head $v = \sqrt{2gh}$. If $v_1 = \frac{3}{4} v$, a cone is not necessary, and the pipe will be full. On the contrary, if the head of water is low in the hox, or if the level falls to ahout the pipe opening, the cone is necessary. At least the pipe opening must have the form of vena contracta, i. e., the pipe opening must he $\frac{3}{4}$ in area or 1.25 times diameter of the pipe, with length equal to $2\frac{1}{2}$ the diameter of opening. But in practice, this proportion is not sufficient. Supposing h the minimum height of water above the center of the opening, the corresponding velocity at entrance is $\sqrt{2gh}$, and this velocity must give the same amount of water as the normal velocity V stated hy tahles for the pipes. Compensation with the velocity must he made by the areas, and thence, A heing the area of inlet opening or D its diameter, a and d area and diameter for the pipe, we must have

$$\frac{A}{a} = \frac{D^2}{d^2} = \frac{v}{\sqrt{2gh}}$$

Length must be at least three times the diameter A.

R.

San Francisco, Feb. 17.

THE longest electric power transmission line is in California at the present time, in fact several of the longer power transmission lines are there. The Bay Counties Electric Power Co. delivering over its own transmission line, and that of another company which has not started its dynamos yet, is commercially using power 214 miles from the generating station. Distance does not seem to have added any technical difficulties to the common practice with shorter lines. It is already so ordinary an affair that only Eastern people continue to he impressed hy the engineering of it. It is quite probable that if the engineers who devised and constructed the transmission were asked to make another commercial transmission of power to twice the distance, say 400 miles, they would proceed to do it quite as a matter of course. The telegraphed information that Niagara power has been successfully transmitted and used 40 miles away, or that the Missouri river has been harnessed to wires and sent 65 miles to Butte, Mont., causes no astonishment here. Comparatively the achievements are less notable than those in California which long since ceased to he notable.

THE gold dredger mentioned in the illustrated description of the Robins helt conveyor at Oroville, Cal., in the issue of Feh. 8, 1902, was built by the Bucyrus Dredge Co., South Milwaukee, Wis.

Irrigation Canals.

The ditch that supplies mines is more often a sidehill excavation than an excavation in a level surface. The idea used in construction is to employ the steepest grade that the water will run on without cutting the sides and hottom of the cut, in order that for the quantity of water the ditch carries it shall have the least possihle cross-section area, which means the least quantity of excavation and lowest cost of construction. This is not always carried out into practice as it should he. Some miners who build the ditches often huild them in blind imitation of another ditch, without consideration as to what particular degree of economical construction is ohtained. Sidehill ditch excavation is costly as compared with excavation in a level, and the average harder and more compact character of the sidehill ground increases the difference of cost.

With ditches intended for irrigation, of which the illustrations herewith show the typical appearance and some characteristic structures, the principles guiding construction are almost the opposites of what are applied with the mining ditch. The flatter the grade, down to a grade that will give, say, 1.5 to 2 feet a second rate of flow, the more desirahle the grade is for an irrigating canal. It covers more land with the flat grade, and the flatness of the grade holds the water so that it has ample time to sink into the ground and serve the useful purpose for which it is employed. Irrigation ditches are huilt wide rather than deep. They can he made in very shallow cuts by using the excavated spoil to huild restraining walls to hold the flow. The cost of moving the material out of the cut is on the average much less than with sidehill ditches. Machine excavations can be used economically. Head works and gates are made more permanent and substantial in construction than with mining ditches. Water is expected to flow through them to make arid lands fruitful forever.

Appearance of Irrigation Canal When First Completed.

Appearance of Irrigation Canal Ten Years After Completion.

Headgate of Consolidated Canal Company, Arizona.

Division Gate of Consolidated Canal Company, Arizona.

A Golden Horseshoe Mill Clean-Up*

The first casual glance at the illustration on the front page is likely to suggest that it is out of place in a mining journal. The piled up halls shown are, however, not oranges, hut halls of retorted amalgam—a clean-up of the mill of the Golden Horseshoe gold mine, near Kalgoorlie, West Australia. The mine is situated in what is called the "Golden Mile Circle" and is extremely productive, the monthly clean-ups going hetween 15,000 and 16,000 ounces. The ore is very high grade, and the output includes recovery directly in the mill hy amalgamation, and from the cyanide treatment of auriferous sulphides and tellurides.

*See illustration on front page.

Cochise County, Arizona.

[STAFF CORRESPONDENCE.]

The mine of the Great Western Copper M. Co. is on the northern slope of the Dragoon range, near the northern end, their locations covering a portion of a north and south helt, within a lime, porphyry and diorite formation. The ores comprise mainly copper carhonates in a lime and porphyry gangue. The richer shoots are usually at the contact between lime and diorite. The ore hodies are in the nature of deposits, rather than veins. The property is well developed hy means of a numher of shafts and a great deal of drifting in ore from the principal shaft, which is 325 feet deep. The ore shipments, within the last five years, are said to have aggregated the value of $250,000. The ores run from 10% to 40% copper and at present ahout 200 tons a month are shipped. At present depth the work is getting into a sulphide ore. They have here a gasoline hoist and a steam pump, the latter handling ahout 45,000 gallons of water per twenty-four hours. A force of forty men are employed. F. M. Knapp is superintendent and W. O. Ahhott assayer. The property is 27 miles south of Cochise station, the latter heing on the S. P. R. R.

In the same locality C. W. Blackhurn and hrother of Tombstone are developing a group of claims, wherein there is a good showing near the surface of chloride of silver in a lime gangue. Shipments of forty cars of ore have heen made from the group from workings within 40 feet of the surface.

Some distance northwest of this is the Barrett property, helonging to the King of Arizona M. Co. It is considerably developed through a tunnel and incline shaft, opening a ledge of copper ore. The property includes a 60-ton smelting furnace. K. Preston is at present in charge.

Gleeson, Feh. 17.

The Silver-Lead Mines Near Darwin, Inyo County, Cal.

Written for the MINING AND SCIENTIFIC PRESS by A. B. CHITTENDEN.

While there are many now deserted mining camps that have had a varied and interesting experience, it is douhtful if there are many that have grown, flourished and passed into a stage of decay, to wait for a new day and a possible new fame, as that of Darwin, in Inyo county, Cal.

The ruins of old smelting furnaces attract attention to the days, three decades gone, when the silver-lead mines to the east of that town were yielding their rich ore in great quantities. The evident desire of the men who had control of these mines at that time was a large monthly production, rather than a continuance of mining, as shown hy the manner in which the properties have heen gophered in the simple following of the streak of richest ore which would suddenly widen and yield a fortune quickly. Thus hut a part of the ore bodies which doubtless exist have heen opened, and in some of the others there is a considerahle quantity of lower grade ore which might he made to yield profits, especially if it were not for the policy of the railroad company in making high freight rates, which, coupled with the cost of unavoidahle teaming, make transportation a luxury that mining here can not afford.

But little work has heen done in comprehensive development, and as hut in one or two instances has outside capital hecome interested, little has heen done toward the exploitation and intelligent handling of ores already exposed.

Apparently, there are possihilities hoth in the old mines and the prospects of the region worth consideration. There are a numher of well-defined ledges running in all directions, the values existing largely in pockets. Pits and small shafts are quite common, and ahout each is some story of rich ore which was taken out when the hunch hecame exhausted. A ledge may contain a silver ore carrying hut a trace of lead; then again the conditions may he reversed, or minerals of both metals he present in quantity. Moisture having dried from the surface matter, its natural leaching action has not accomplished much concentration at any great depth from the surface.

The medium grade of ore from a few of these mines has been concentrated and prepared for shipment to smelters hy working in crude wooden jigs, necessi-

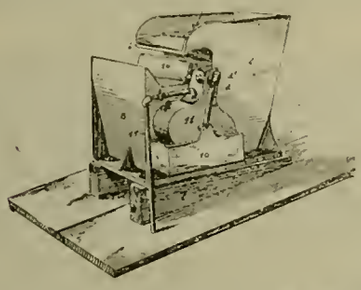
tating from five to ten minutes' work of a man on a few shovelfuls of the oxidized ore, and that coarsely crushed by hand, which operates against any clean separation of gangue from the ore. These mines have a little more than paid expenses by this method, which goes to show the possible profits to he obtained by a larger scale and more economical practice, especially if several mines were brought under one management.

Mining and Metallurgical Patents.

Patents Issued February 18, 1902.

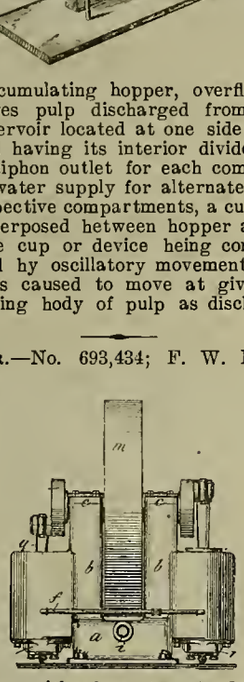
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

ORE OR PULP SAMPLER.—No. 693,690; W. G. Dodd, San Francisco, Cal.



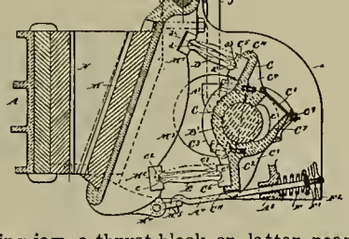
A pulp accumulating hopper, overflow chamber which receives pulp discharged from hopper, a swinging reservoir located at one side of overflow chamber and having its interior divided into compartments, siphon outlet for each compartment of reservoir, a water supply for alternately delivering water to respective compartments, a cup or collecting device interposed hetween hopper and overflow chamber, the cup or device heing connected with and actuated hy oscillatory movement of reservoir whereby it is caused to move at given intervals through flowing hody of pulp as discharged from hopper.

COMPRESSOR.—No. 693,434; F. W. Parsons, Elmira, N. Y.



A compressor with a hase, two standards uprising therefrom and having bearings at upper ends, and two vertical cylinders arranged one on outside of each standard; cylinders, standards and hase heing in one integral casting, a shaft mounted in standard hearings, a fly-wheel secured upon shaft and arranged hetween hearings, crank pins carried hy shaft and arranged one on outside of each standard, pistons in cylinders, connecting rods connecting crank pins with pistons, and an inlet and outlet for fluid acted upon in cylinders.

ROCK CRUSHER.—No. 693,580; W. R. Young, Brooklyn, N. Y.

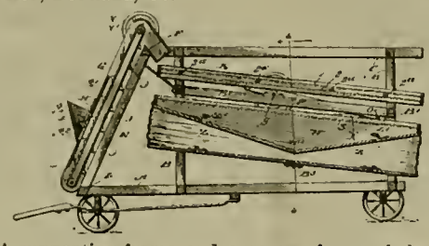


A swing jaw, a thrust hlock on latter near line of oscillation, a thrust hlock carried by jaw at a distance from first, a main shaft in rear of jaw, an eccentric block thereon having oppositely extending arms, and thrust plates extending from latter to thrust blocks, eccentric hlock mounted loosely on eccentric wherehy eccentric hlock may move relatively to eccentric as required in equalizing difference in lengths of arc described by thrust blocks.

METALLURGICAL PROCESS.—No. 693,482; E. G. Acheson, Buffalo, N. Y.

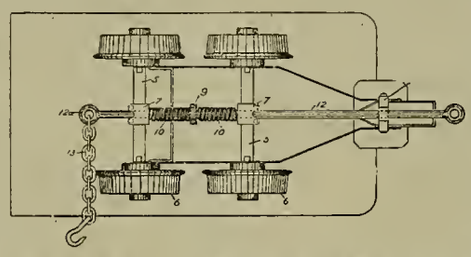
Reducing ores hy mixing pulverized ore with graphite as sole conducting and reducing agent, both in a dry state, coating particles of ore with graphite, and passing an electric current through mass of such coated particles, thereby heating to a point sufficient to effect reduction of ore.

ORE SEPARATING MACHINE.—No. 693,709; J. C. Hoefer, Portland, Or.



A supporting frame and a screen frame shakahly mounted on supporting frame; a second screen holding frame shakably mounted on supporting frame, independently of first screen frame, second frame having its hottom inclined downward from opposite ends, a hellows section W^2, under each inclined bottom portion, having valved blast discharges through hottom, sections W^2 W^2 having a hinged connection, and means for imparting a simultaneous shaking motion to screen frames, and comprising two hellows sections.

DRAW BAR FOR ORE CARS.—No. 693,810; G. E. Truax, Denver, Colo.



The axles and hoxes mounted thereon, draw har slidahle in boxes, stop on draw bar hetween axles, and a coil spring mounted on draw bar and interposed hetween stop and each hox, arrangement being such that car may be pulled hy applying power to either extremity of draw har.

Determination of Values From Sampling.

By S. G. DEWSNAP.

If the vein to he sampled should he of banded structure of which the different hands differ considerably in character and value, it is more accurate to sample each hand separately, and, if you wish to get at the total value of the whole, to make a calculation from the results ohtained from the different hands.

The following example of such a vein will make this method clear. A certain vein consists of four hands, as follows:

Six inches, value $23 per ton, gold and silver.

Twelve inches, value $7 per ton, gold and silver.

Twenty-two inches, value $3.40 per ton, gold and silver.

Eight inches, value $42.20 per ton, gold and silver.

To determine the total value of the whole taken together, multiply the number of inches in width hy its value and add together. Then divide hy the whole numher of inches, which will give the value of the cross-section in the case ahove.

6 × $23 00 =	$138 00
12 × $7 00 =	84 00
22 × $3 40 =	74 80
8 × $42 20 =	337 60
48	$634 40

$634.40 divided hy 48 will give $13.22 per ton value for the whole ledge.

This method requires some trouhle and more expense than hy crosscutting, but gives more information. In the case stated the manager secures sufficient knowledge to determine whether it will he more profitahle to take out and ship to the reduction works the whole vein or to assort it, shipping only the one or two streaks of greatest value.

A shaft may be sampled by crosscutting, the same as a tunnel. The more accurately and carefully the sampling is done the more concordant will the results obtained he. To determine the value of a dump of ore pieces may he taken from over the entire surface and two or more trenches may he cut through the ore on the dump, and these trenches sampled their entire length to the hottom, and the whole so obtained cracked and quartered until a sample is had, the same as for a tunnel or shaft or other mine working.

It is of the greatest importance to every mine to have a hook of sampling in which is recorded how and where each sample was taken. A good way is to number the samples at the mine and book accurately the details regarding that sample; its values as obtained from the assayer's certificate can he placed in another column. Then by reference the results of different samples may he checked up.—Republic, Wash., Pioneer-Miner.

The Ultimate Velocity of Gases.

Written for the MINING AND SCIENTIFIC PRESS by H. D. DIBBLE

The ultimate velocity, that is the complete or final velocity of gases under pressure into the atmosphere or vacuum, is a question on which the authorities seem to disagree to an extent that ofttimes completely baffles the practical engineer as well as the student in thermo-dynamics. Much that is inaccurate and untrue is printed on the suhject even in scientific papers.

The heat formula given below is offered as a partial solution at least of this complex problem. To find the ultimate velocity of steam it might he well to first find the velocity of air at the temperature and pressure of the steam, the velocity of steam would then be inversely as the square root of its density compared with that of the air. If the density of air he taken as 1 and that of steam at .6225, the square root of .6225 will be .7889, then if we divide the velocity of air by the decimal .7889 we will have the velocity of steam under the same conditions.

The question may he asked: Why not find the velocity of water under the pressure of the air, then multiply this by the square root of 815, air heing that much lighter than water; hut this rule will not work, to the dismay of many a student in physics; the reason is not hard to explain and will not he given here.

This question is not one of theoretical interest only, hut must soon become a practical, every-day question with the up-to-date engineer. The steam turhine is a machine that changes the kinetic energy of the steam at these velocities into work, and is even now the most efficient heat engine known.

By velocity I mean the complete ultimate velocity, the expansion heing allowed for. I have a large numher of tahles on the velocities of gases under pressure, including some of the very latest works on compressed air. They all give me the velocity of the gas at its compressed density, and state the rule "that if the compressed gas is flowing in to an ahsolute vacuum the velocity is the same for all pressures, he it one or one thousand pounds." When the compressed gas is flowing in to the atmosphere it can never have a velocity equal to that in a vacuum, let the pressure be what it may.

I can understand all of this and the reasons therefor, provided the gases are taken at their compressed density. All the works I have on the suhject gave the velocities without any reservations, and left me to infer at least that that was their complete velocities. How to get the complete velocities of these expanding gases was a prohlem that haffled me for a long time.

Finally it dawned upon me that the heat given up hy the expanding gas ought to just halance the kinetic energy of the jet. Acting on this suggestion, I saw by the tables that air under 132.3 pounds gauge pressure had a theoretical velocity 1275 feet per second. If the air had heen compressed in a compressor that was without friction and the jet received hy a turbine of 100% efficiency there would still he a loss of more than one-half.

Air at 60° F. (by the tahles) at 0 gauge pressure or 14.7 absolute flowing into a vacuum had a velocity of 1337.7 feet per second. By the process for the ultimate velocity, air at 60° F., expanding to a vacuum, gives up all its heat to the point of liquefaction, or say to 312° F. helow zero (probahly lower than in a vacuum, besides it may give up some of its latent heat, but this will suffice for our purpose); 372 then multiplied hy the specific heat of air, .2374, gives us 88.31 heat units × 772 gives us 68,175.3, the square root of this hy the square root of twice gravity gives as the ultimate velocity 2094 feet per second.

At the gauge pressure of 132.3 pounds per square inch, temperature 555° F., the velocity of flow into the air by the tahle is 1795 feet per second. By the heat formula, the loss of heat as air at the gauge pressure of 132.3 pounds per square inch, and then 555° F. expands to the atmosphere, is 495° F., and, by the rule given above, its ultimate velocity is 2414 feet.

If our rule is right, it will give us results to correspond with the rule that "the velocity of a gas at a given pressure will vary inversely as the square root of their densities." We will now try it on air compressed to the same pressure, but at different temperatures.

We will start at a temperature of 100° F. and compress to a pressure of 294 pounds per square inch in one case and from a temperature 0° F. to the same pressure in the other. In the first case we raise the temperature from 100° F. to 900° F., or 800° net, and in the other case we raise the temperature from 0° F. to 650° F. Without allowing the temperature to fall in either case we permit the compressed air to escape through their respective orifices. By the heat formula given above we get for the respective theoretical velocities 3,049.354 and 2,767.702. If we take air at 650° F. as 1 then the density of air at 900° F. will be .8260, and the square root of that is .9088, multiplying by 3,049.354 we get 2,771.252, which practically checks with the other result.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

TANANA.

The McLeane Trading & Development Co. has been incorporated at Spokane, Wash., to operate mines and other property in the Tanana district. It is capitalized at $50,000. A. G. McLeane is president, G. C. Menthorn secretary and treasurer and A. F. Raynor manager and superintendent.

ARIZONA.

COCHISE COUNTY.

A strike has been made in the Casey group of copper claims by P. J. Scanlan & Co. of Bisbee, who are operating there under a bond. The shaft is now down 45 feet in solid ore. Average assays show gold .51 ounce, silver 85.2 ounces, copper 10%, total value per ton $83.

P. Kirk and A. J. Pigeon of San Francisco have organized the Empire Smelting Co., and are now on the ground at Benson preparing plans of a custom smelting plant which the company will build there.

The Bisbee West Copper Co. of Bisbee has contracted for a pumping plant with a capacity of 100 gallons per minute. Supt. F. L. Dwight says that after the water supply is demonstrated to be permanent the water will be piped into Bisbee and sold. The company intends using oil in the future for fuel, a 700-gallon tank being now in course of construction at Don Luis.

The pump columns in the shaft of the Tombstone Con. Mines Co. at Tombstone are 15 inches in diameter and 22 feet in length. There will be four triple expansion station pumps with the necessary sinking pumps accompanying same, and the work of draining the lower levels will be accomplished by maintaining a capacity of 1700 to 1800 gallons per minute. It is expected that the pumps will be installed and in complete working order by July 1st. A new steel gallows frame 60 feet high and steel building frames will be erected at the shaft. A place for the 800 H. P. boilers is graded out and plans made for the hoisting engine itself, which is to be direct acting, with flat rope cable and capacity for 2500 feet. When the pumps are installed sinking will be resumed.

GRAHAM COUNTY.

J. Molder, Supt. of the Home Copper Co., near Clifton, says the company is considering the proposition of putting in an electric power plant. The company owns a spring with 800 feet available head. The spring is said to afford an abundance of water for the purpose desired.

E. U. Beauchamp, for the Polaris M. & M. Co., has bought the Polaris group of nineteen gold claims near Clifton. The purchase also includes a mill site on the San Francisco river and a 20-stamp gold mill at Evans' point, which will be remodeled.

MARICOPA COUNTY.

E. W. Fisher of Wickenburg has sold one of his properties near there for $8000 to the Bisbee Belle M. Co. of Los Angeles, Cal. Operations will be begun on the mine at once by the company, of which G. M. Cabe is president.

J. Boyd has made a strike in his mining claim 16 miles north of Phœnix at 130 feet down. A ledge 4½ feet wide, carrying $50 per ton in gold, has been encountered.

MOHAVE COUNTY.

The 200-ton concentrator of the Philadelphia & Arizona mine at Chloride is completed and ready for operation. C. N. Hassan has charge of the mill and A. M. MacDuffee the metallurgical department.

SANTA CRUZ COUNTY.

The Buena Vista M. Co., operating near Nogales, have installed an electric drill plant operated by a fine gasoline engine.

At the Pena Bianca mine, near Nogales, high-grade ore is now being stoped out and put upon the dump. It is the intention of Manager Hurst to sink the shaft, now 100 feet down, to the 500 level. A hoist will be installed.

YAVAPAI COUNTY.

The Val Verde smelter has been started up under the supervision of F. E. Bretherington, late of Denver, Colo. There is a great deal of ore on hand and the supply is on the increase.

The Merchants' M. Co., which owns a group of mines in the Big Bug district, near the town of Providence, has reached the 200-foot level on its main double-compartment shaft. It is reported that 3 feet of concentrating ore in the lower workings of the mine goes $12.70 per ton in gold. E. Block of Prescott is manager.

The Home G. M. & D. Co., operating in the Weaver district, near Prescott, and owning five claims there, has a shaft down 200 feet in good concentrating ore. They propose to install a hoisting plant and continue sinking.

The Penn G. M. Co. is working about 100 men at its Mudhole mine on Lynx creek, 14 miles from Prescott, and are crushing over 100 tons of ore a day.

CALIFORNIA.

AMADOR COUNTY.

The Ogalalla G. M. Co. has been incorporated in Oakland with capital $25,000, to mine in Amador and El Dorado counties, Cal. The directors are: C. Smith of Oakland, J. W. Rigsby of San Francisco, N. M. Fay of Fruitvale, J. D. Maxwell of Latrobe, El Dorado county, and G. W. Bowles of Plymouth.

Chase & Sons have their machinery in working order and are ready to turn the Mokelumne river at Clinton Bar when low water comes. They have been mining there steadily for the last four years, with the view of ultimately getting into the river bed. This preliminary work has paid expenses as it progressed.

The tunnel on the Rabbit Hill lode, near Jackson, is being run in on the ledge and will be continued ahead for another 300 feet. The ore extracted is of good grade and carries 3% sulphurets. An arrastra is running continually, prospecting the rock, and 200 tons will be tried in a stamp mill before considering the putting up of a stamp mill on the property.

At the Kennedy mine the cutting of the stations and building of the chutes at the 2400 and 2500 levels of the east shaft have been completed. The chutes are estimated to hold about 1000 tons of rock each. Crosscutting toward the north shaft has been started from both the 2400 and 2500 levels. The total depth of the east shaft is 2630 feet, the deepest on the mother lode. About thirty men are employed in and around the shaft. It is said that a new 60-stamp mill will be built during the coming summer.

CALAVERAS COUNTY.

J. C. Jens, a shareholder of the Iowa Consolidated mines at Rich Gulch, and W. C. Ramsey of Stockton have been examining development in the mine and state that it is the intention of the company to erect a 40-stamp mill in the near future.

At the Sugar Pine mine, near Angels Camp, owned by the the San Joaquin M. Co., the new mill is completed and is to be started up for continuous operation. The mine is showing rock of good quality. J. McClay is Supt.

EL DORADO COUNTY.

The Toll House mine, near Placerville, has been sold at sheriff sale to a Mr. Perkins of Cleveland, O., who is one of the largest stockholders in the company, for $2084. There are over 100 acres of ground belonging to the mine and also a 20-stamp mill, with hoisting works and machinery.

The River Hill mine at Placerville is working a full force of men. The mill has been crushing 80 tons of rock daily and with a change in the drop of the stamps from 80 to 107 per minute it is expected to crush 100 tons of ore per day.

As the result of one day's cleanup at Lotus, it is reported that two men took out twelve pounds of gold, or about $3000. The locality is only 2 miles from Colma, where gold was discovered in 1848.

HUMBOLDT COUNTY.

At Hopkins creek, on the Klamath river, near Orleans, Miller Bros. of Sacramento are making preparations to operate their hydraulic mine on an extensive scale.——At the mouth of Slate creek, the Big Bar M. Co., A. Brown, Supt., is operating its mine night and day. The Big Bar mine is owned in Eureka. G. A. Waldner is president, and H. H. Buhne secretary.——J. Fehely and W. Lord have leased the Red Cap mine, opposite the mouth of Red Cap creek, and will reopen it. The mine has not been operated for years.——The Orleans Bar G. M. Co. is running up to full capacity, there being plenty of water.

INYO COUNTY.

A discovery, near Darwin, of a large deposit of tin ore is reported. The story is that the finder noted and traced the deposit, which showed an unknown mineral in large quantities. Roasting a piece of the ore in a forge, a button of white metal was reduced from it which on analysis proved to be tin. The exact locality of the find has not been disclosed, the finder not having perfected locations of the deposit.

MARIPOSA COUNTY.

C. Austin has bonded his mining properties in the vicinity of Whitlook to J. H. Gifford of Sonora at $35,000 for fourteen months. Four claims are included in the sale. Work is to be commenced at once. Helm & Donovan have also bonded their mine at Whitlock to Gifford at $6000.

NEVADA COUNTY.

The Delhi mine, near Nevada City, recently reopened, with G. Kartschoke Supt., is to have its machinery plant added to by the installation of a duplex compressor of fifteen drills capacity, run by water power. The water wheel will be 10 feet in diameter. It is also the intention of the Delhi Co. to erect chlorination works with a capacity of four tons of sulphurets a day.

The machinery is being put in order and other improvements made at the Franklin mine in Willow valley, near Nevada City, preparatory to sinking the shaft. M. Hussey is the owner.

At the Hampton & Gage mine in Willow valley, near Nevada City, a new hoisting plant is to be installed. Supt. Bray has decided to sink a new shaft.

E. Lawrence, Supt. of the Gold Tunnel mine, above Nevada City, has arranged for the building and equipment of a new hoisting rig and work on it has been started.

PLACER COUNTY.

Nine men are employed at the Shady Run quartz mine, near Towle. R. A. Watson is Supt. The company will soon let a contract to extend the lower tunnel 1000 feet.

The Bellevue M. Co. at Ophir are taking out high-grade rock from the California mine.

The Washington M. Co. at Forest Hill have sunk a double-compartment shaft 75 feet below the level of the tunnel. Drifts run 78 feet east and west show 3½ feet of ribbon quartz in the ledge.

Good quartz is being taken from the Decker mine, near Newcastle, by F. Brye, A. L. Smith, F. Bartlett and P. Lozano of Auburn and G. L. Threlkel of Newcastle, who is Supt.

SAN BERNARDINO COUNTY.

J. Johnson, late of Cripple Creek, Colo., verifies the report of the discovery of the rich gold mine at Dale. He writes from Dale, where he has investigated the new bonanza, and says that the new strike was found in a large iron ledge by crosscutting it to a depth of 30 feet. The ledge is about 100 feet wide. All of it will pay. The rich streak is 15 inches wide.

SHASTA COUNTY.

It is reported that the Quartz Hill mine, near Redding, is to be reopened by the Original Quartz Hill G. M. Co. of Chicago, Ill. The mine has lain idle for several years. Recently the company lost its mill and machinery by fire. A. Spetz, president of the company, and A. Kwasigood, secretary, both of Chicago, have recently visited the mine and previous to their departure stated that it would be worked and that the ore would be taken to Keswick to be smelted.

The Niagara mine, near French Gulch, owned by a Holland company and under the management of W. A. St. Auburn, is to be reopened. The first shipment of machinery and equipment is en route to the mines, which will be reopened through the old tunnels.

SISKIYOU COUNTY.

The Cherry Hill quartz mill at Cherry Creek, near Yreka, has been started up to crush ore from the upper or old tunnel. The new tunnel is in nearly 900 feet, and it is expected to strike the ledge somewhere between 1300 and 1500 feet from the entrance.

B. Kenyon of Yreka has put up a 3-stamp water power mill on Humbug, in connection with an arrastra. He owns seven claims. Some quartz taken out has paid as high as $300 a ton.

TUOLUMNE COUNTY.

The Jamestown M. & M. Co. has transferred to C. H. Treat of Los Angeles the bond on the Badger mine, near Jamestown, made by J. M. Palmer, A. L. Ellis, et al. The bond includes the Calker and Annie Dwyer quartz mines, adjoining the Badger. A 10-stamp mill will be erected on the Badger mine in the near future.

A company has been organized by Jeff Doolittle and A. Brown to dredge the Tuolumne river near La Grange for gold. The company has bonded the bottom land and orchards from La Grange down stream for 6 miles. The terms of the bonds permit the owners of the land to occupy it until the dredger gets actually to work in it and provide for a reversion. The wood on the river bank is also bought by the dredging company. T. Donahue of Sonora is the managing agent of the company. The work laid out contemplates the expenditure of $200,000.

The Campo Seco M. Co. is having an office and blacksmith shop built on its property, between Quartz and Jamestown. The sinking of a double-compartment shaft will commence shortly. J. H. Hall is Supt.

A lump of gold weighing eleven and one-quarter pounds, valued at $2400, has been picked up in the gravel claim of Conlin & Pownall, near Columbia.

The Black Oak mine, near Columbia, is reported to be in bonanza ore as the result of a strike that has been made in the north and south drifts at the bottom of the 1050-foot shaft. In the north end the ore is rich, going $70 to the ton. In the south it goes $30. The ore body is from 5 to 6 feet in width.

COLORADO.

BOULDER COUNTY.

The Silver Lake mine, near Ward, is being worked throughout the winter with a small force of men. The mine in 1901 was equipped with a modern hoisting plant, housed in a shaft house 28x40 feet. Development work only is being done to increase the ore reserves.

Late work in the crosscut tunnel being driven to cut under the shaft workings on the Red Lion mine, at Ward, develops that the tunnel has entered the ore zone 600 feet in from entry. Supt. Hutchinson says the tunnel is in an ore body or ledge of iron sulphides, with some smelting but chiefly milling ore.

CLEAR CREEK COUNTY.

A strike of very rich ore has been made in the North Star mine, at Argentine, which is being operated by M. Bonham & Co. under a lease and bond. Tests made on samples returned 12 ounces gold and 524 ounces silver. The ore is auriferous hessite, a telluride of silver and gold.

In the Empire tunnel, at Georgetown, rapid progress is being made, the average being about 5 feet per round. Quantities of live iron are found in the heading and the flow of water is also increasing, which is regarded as a favorable indication of a lode close ahead.

Manager Kelly is setting the boilers at the Kelly Tunnel plant, near Georgetown, and has the air line from compressor house to the tunnel connected up. He has built a powder warmer near the blower house. This is a small house in which hot water pipes will be run from a heater in the blower house, keeping a large quantity of powder in condition for use at all times.

Baer & Lees, who secured a large contract in the Manhattan tunnel from the Yankee Con. M., M. & T. Co., have driven the tunnel 220 feet and cut four veins in the first 190 feet. A party of engineers sent out by the company has selected the place for the new tunnel plant, which will be erected immediately. The company will install an 80 H. P. or 100 H. P. boiler and a 6-drill air compressor. The plant will be located about 200 feet from the tunnel entrance and to one side.

Idaho Springs people have bought the Silver Horn tunnel of L. McLean and are planning to extend it. The tunnel is now in 500 feet, the ore taken out in making repaying all the costs of driving it this distance by hand. J. W. Boyd is at the head of the enterprise.

The Detroit M. & Red. Co., a new organization composed of Idaho Springs and Eastern people, propose to build a new concentrator at Idaho Springs without delay. It will have a capacity for treating about 100 tons per day. Electric power will be used, but it will also have a steam plant for use in case of emergencies and will be heated throughout with steam. It is also reported that another mill having a capacity of 200 tons per day is being planned for Idaho Springs.

Manager J. Owen of the Morning Star mine on Seaton mountain, near Idaho Springs, is to put in a new hoist and compressor plant to sink the shaft to a connection with the Newhouse tunnel. He will also drift in the Newhouse tunnel along the vein.

The Seaton Mountain Electric Co. has completed stringing its wires to the Gem mines, which will put in a complete plant of new machinery to be operated with electricity.

CUSTER COUNTY.

A. B. Colburn, who has been prospecting west of Westcliffe during the past two years, claims he has finally discovered the pay rock in place. Gold is abundant in it and the yield is from $45 to $90 per ton. It is found in the granite near the contact between granite and porphyry. The gold appears in black tellurium, coating a kind of hematite along with a shelly kind of stone. Hundreds of acres have already been staked. Windlasses are being placed on some of the properties.

EL PASO COUNTY.

The tailing dump of the Metallic G. Ext. Co. at Florence, owned by the United States Red. & Ref. Co., contains 600,000 to 800,000 tons, which is now being treated at the rate of about 400 tons per day with a considerable profit, estimated to result in the aggregate to considerably over half a million dollars. The dump consists of tailings from the Cripple Creek ores which were supposed to have been worked close.

GILPIN COUNTY.

(Special Correspondence).—The Ontario-Colorado G. M. Co., operating on Gregory hill, near Central City, did 1229 feet of drifting, 130 feet of upraise and winze

work and 189 feet of sinking within the past year. The shaft is now 666 feet deep, the total drifting on various levels amounting to 2000 feet. The plan is to sink the shaft to 1000 feet depth within the next year. The production thus far has been only incidental to development. The mine has a modern plant of hoisting machinery, air compressor, machine shop and ore-sorting bins. By the time the mine is well opened up the company will doubtless have a mill erected. H. C. Eastman is manager.

Central City, Feb. 17.

The Klondike and Texas lodes at Russell are being operated by the Keystone G. & C. M. Co. of Cozad, Neb., with J. L. Mitchell as Supt. The shaft, now down 200 feet, will be put to a depth of 300 feet. A whim is being used at present for hoisting, but will be superseded by a gasoline hoisting plant at an early date.

OURAY COUNTY.

The Camp Bird Extension is testing ore and preparing plans for the erection of a large mill at Ironton. They have a 25-foot body of ore which is claimed to run over $20 to the ton, and have drifted on it for 400 feet.——The Red Mountain M. & M. Co. is getting in shape for work during the summer. The water is being taken from the shaft of the Hudson claim and development work is being done on the National Belle. About fifty men are employed at present.

PITKIN COUNTY.

The Argentum-Juniata M Co. report for the last quarter of 1901 shows for the three months' operation of the mine at Aspen $6749.25 net profits. The report of Manager Palmer states the production to be 2122 net tons, the gross value of which was $92,621.50. The railroad freight was $12,537.13, treatment charges $9514 14, and the net cash returns were $69,734.04, making the average value per ton $32 85. Out of the net returns of $69,734.03 had to be paid the shipping and selling expense amounting to $23,726, and payment to lessees $11,830, making $35,556. The mine and mill operating expenses amounted to $47,888. For the quarter, the "gross ton production per diem, running time," was 126.65 tons, average, as against 123.48 tons for the preceding quarter; the "degree of concentration" is 10.06 tons into 1 as against 10.87 into 1, and the "actual milling cost, per ton gross," is $0.7538, average, as against $1.0094.

SAN JUAN COUNTY.

O. Hansen, manager of the Idaho group at Silverton, being operated by the Schiffer Bros. of Alamosa, says that, after running a tunnel about 1000 feet, a strong 5-foot gold and copper-bearing vein was opened on which the showing, he states, was good enough to warrant the erection of a concentrating mill, and this work will be undertaken in the summer.

W. F. Kenrick of the Henrietta mine at Silverton, who has been giving a close study to the economic features in the operation of electric drills as compared with the old hand work, says that the hand drills have been making 1½ feet per shift by hand in extremely hard rock and at an expense in wages of $20 a foot, or a total of $30 a foot. With the electric drills the labor of two men costs $8 a shift, $1.50 for extra help at tramming and $2 for powder and expense of running the gasoline engine which drives the dynamo, which also lights the mine. This makes a total of between $11 and $12, as against $30 on the hand drill work.

The Wahuse M. Co. are operating on a large area of mining ground in Hematite gulch, near Silverton, under Foreman Lonergan. Work at present is in the lower tunnel on a large vein of concentrating ore. It is stated that the company has determined to build a large mill and connect it by tramway to the mines.

The Green Mountain M. & M. Co. have planned developments and made $10,000 immediately available for contracts on account of them. W. Bielefeldt, Supt., says that should the result of the proposed development be satisfactory the company will commence the erection of a 100-ton mill.

SAN MIGUEL COUNTY.

(Special Correspondence). — The Alta mill, in Alta basin, near Telluride, is operating successfully on ores from the Alta mine, which have an iron-lead sulphide base, carrying silver, gold, lead and copper, averaging $7 per ton. The milling method, arranged by C. M. Hampson of Denver, is one of first and second concentration, by which a saving of 76% is made. By a series of crushers, rolls and screens the material goes to Bartlett tables not less than 12 mesh. The table tailings pass over the new Bartlett slime tables, on which a substantial saving is made. The concentrate product runs about 3% copper, one-half ounce gold, thirty-nine ounces silver, 12% lead, 26% iron and 12% silica, the degree of concentration being 5½ to 1. At the mine an upraise is being made from the tunnel level to the upper levels, where a higher grade of ore is found.

Telluride, Feb. 24.

W. J. Scoutt, former manager of the Suffolk-Globe mines, has a contract to drive a tunnel on the Badger group at Telluride, owned by A. T. Hathaway of Colorado Springs. It is estimated that the tunnel will cost $8000 and will intersect the Crown Point and Santa Cruz veins 800 feet below the surface. Electric drills will be installed.

A rich strike has been made in the Cincinnati mine, at Telluride, owned by the Tomboy G. M. Co. The vein struck is 8 feet wide at the face and samples assayed show high values. The ore is a heavy galena thickly impregnated with gold. This mine is the northern extension of the Argentine, which was bought by the Tomboy Co. two years ago.

TELLER COUNTY.

At the Laura Lee mine, at Cripple Creek, under lease to Peterson & Stone, the whim is up and ore is being hoisted. A shipment of about twenty-five tons will be made from the property. Over fifty properties will start up as a result of the recent find. Guffey, Galey & McKelvy, who own eight patented properties adjoining the Laura Lee, will lease all of their properties but the nearest one, and on this they will proceed at once to sink a 1000-foot shaft.

The Cripple Creek-Colorado Co. has commenced sinking to the 1000-foot level with the new plant of machinery. The present depth of the shaft is 500 feet and it will be pushed down continuously. Included in the added equipment installed is a 6-drill compresser.

A report states that in the Bare Hills district, 12 miles west of Cripple Creek, W. Reed, a prospector, has developed an 8-foot vein of copper and gold bearing ore from which assays showed 20% copper and $23 gold to the ton.

The 700-foot level in the Doctor-Jack Pot mine at Cripple Creek, it is stated, has opened on the ore shoot which has been sought for during the past three months.

The Metallic M. & T. Co., owning on Rhyolite mountain, at Cripple Creek, has let a contract to D. Welch for 250 feet of work. There is a plant of machinery already on the ground. The tunnel is now in some 200 feet and will be driven to 500 feet.

IDAHO.

BLAINE COUNTY.

A strike has been made in the Glengarry mine, on the Hailey gold belt, owned by B. F. Oliver, who has been developing the claim by a tunnel that has struck the vein at a depth of 75 feet. The vein shows a streak of ore that carries high values in silver, some gold and a little copper.

C. F. Heckler, secretary and treasurer of the Union Standard G. Co., and M. L. Moyer, general manager, are expected from Philadelphia to start active operations on the Comet group, near Soldier.

IDAHO COUNTY.

H. L. Hollister of Hailey has bought from C. DeGrundy three claims adjoining the townsite of Roosevelt at Thunder mountain for $10,000. The first payment has been made.

H. E. Taylor of Weiser reports a new find at Thunder mountain, struck in a tunnel about 75 or 80 feet west of the main ore body that shows on the surface in the Fairview group. The ore prospects well in free gold and all is high grade.

A. J. Payne of Lewiston, manager of the Buffalo-Golden Gate M. & M. Co., which owns three claims in Buffalo Hump, says the company has not been doing any development work during the winter, but expect to resume operations about May 1. The mine has a 6-foot ledge of ore, with assays running from $10 to $30 per ton. He states that it is the intention of the company to put in a new stamp mill this summer.

W. A. Stevens, manager of the Big Buffalo Syndicate's properties in Buffalo Hump, says: "We are now running the mill with ore from the Big Buffalo, and the cleanups are satisfactory. The Jumbo is running constantly and is shipping from $5000 to $6000 monthly.——As soon as the Wise Boy mill is working, its bullion shipments will be fully as large. Machinery for the Wise Boy mill is now being hauled out from Stites and will probably all be in place by the last of March. ——The Crackerjack has been developed extensively this winter. The stamp mill machinery for it will be put in this summer.

The Thunder Mountain Free Gold M. & M. Co. has been incorporated at Spokane, Wash., capital $150,000, with J. Z. Moore president and R. F. Kellam secretary. The company says that it owns two claims —the Iconoclast and the Cripple Creek at Thunder mountain.

LEMHI COUNTY.

The Boston-Idaho M. Co. has been incorporated at Salt Lake City, Utah, capital $500,000, with W. H. Tibbalis president and E. J. Waugh secretary. The company owns the Emerald Isle and Dummy claims, together with a bond and lease on the Shamrock claim in the Spring Mountain district. The property was worked many years ago and, it is claimed, yielded good values in silver and copper.

OWYHEE COUNTY.

The newly organized Addie M. Co., recently incorporated by Silver City people, are reported to have made a very rich strike in an upraise in the mine. There is, it is said, 1 foot of the ore and it is said to run 50 cents to the pound in free gold. The reported strike is almost within the limits of Silver City.

SHOSHONE COUNTY.

A suit has been brought by I. L. Magee of Wallace against the Gold Hunter M. & S. Co. for damages for removal of ore from the Yolande mine, adjoining the Gold Hunter, and a restraining order to prevent the defendant from continuing work on it pending the trial of the cause.

The Alameda M. & M. Co. tunnel has cut the ledge, breaking into a carbonate ore when it passed through the foot wall.

MONTANA.

CASCADE COUNTY.

The Adriance mine, near Jericho, owned by B. Adriance of Brooklyn, N. Y., and R. Bennett of Neihart, is to be worked on a large scale, so the owners state.

DEER LODGE COUNTY.

In the Surething mine at Elliston a strike of 14 feet of concentrating ore has been made in the tunnel. P. Mack is foreman.

FERGUS COUNTY.

Plans for the new 100-ton mill of the North Moccasin G. M. Co., which will be erected near Kendall, have been completed by Engineer W. McClean, and construction works, it is stated, will begin as soon as the material can be placed on the ground. The mill will have some of the latest devices for the work of cyaniding ores.

FLATHEAD COUNTY.

Reports from the West Fisher mining district, near Libby, state that the Illinois & Montana M. Co. is finding some excellent ore. It is announced to be the intention of this company to place a 10-stamp mill on the property in a short time. J. H. Geiger is Supt.

LEWIS AND CLARKE COUNTY.

The Beatrice M. & M. Co., with D. G. Barringer of St. Paul president, E. Napp Supt. and A. McNaughton of Elliston, Mont., treasurer and secretary, has been developing its property at Elliston all winter, with a view of erecting a mill next summer. The company has been blocking out ore so as to get ore reserves in sight before building.

MADISON COUNTY.

E. C. Villiams and B. Krodell of Butte, who have a lease and bond on the Occidental mine at Brandon, are to begin operations on it at once.

The Eureka mine, near Brandon, has been bonded by R. J. Ogden and S. Pritchett to Jackson Bros. of Twin Bridges at $5000. Development work consists of a 60-foot tunnel.

O. B. Suhr, general manager of the Madison Power Co. of Norris, says the machinery of the plant was run without a hitch. The present capacity of the plant (3000 H. P.) has been bought by a Butte mining company, and it is the intention to erect other plants along down the Missouri river canyon.

PARK COUNTY.

W. L. Tipton of Spokane, Wash., who has a bond on the McCauley mining properties in the Crevase district, near Jardine, states that work will be commenced on the property. The mill is to have two new concentrators installed before starting it up.

SILVER BOW COUNTY.

W. A. Clark is reported to have sold his Colusa-Parrott group of mines at Butte to the Amalgamated Copper Co. The purchase by the Amalgamated Co. has been made as a settlement of the litigation between the Anaconda Co. and the Colusa-Parrott Co. The Anaconda ledge was involved in the suit, it having been shown that there was a union between that vein and the Colusa-Parrott vein at a depth of about 600 feet below the surface of the Colusa-Parrott, and that the latter was the prior location. At the trial of the case the Anaconda Co, advanced the theory that there was a third veir, called a diagonal or blue vein, which cut the Anaconda vein and caused the union of veins by a fault or slip, and that in fact there was no union. Judge Knowles of the U. S. Circuit Court accepted that view of the case and decided in favor of the Anaconda Co. There was developed at the trial the fact that the Anaconda Co. had been mining on one of the Colusa-Parrott veins not included in the original controversy, and another suit for heavy damages was brought against the Anaconda Co. and is now pending. All litigation will now be dismissed. The sale includes the Colusa-Parrott mine and smaller mines known as the Parks-Parrott and the Micawber.

A. McIntyre of Walkerville, who is opening up a group of five quartz claims in the Vipond mining district, says he is sinking a 300-foot shaft and driving two tunnels on the property. The shaft is now 166 feet deep and one of the tunnels is in about 200 feet. All of the hoisting from the shaft is done with a whim. So far no water has been encountered. The property is known as the Vipond group. The ore contains copper, gold and silver, and is shipped for treatment.

NEVADA.

EUREKA COUNTY.

It is stated that the Richmond mining property at Ruby Hill, Eureka, has been sold to the Eureka Con. Co. Negotiations have been pending for a long time.

NYE COUNTY.

The Utah-Tonopah M. Co. has been incorporated in Salt Lake City, Utah, with $5000 capital. Le Grand Young is president and W. C. Spence secretary and treasurer. The company owns seventeen claims in the Tonopah mining district. G. T. Halladay, Supt. of the company, has a small force of men at work.

WASHOE COUNTY.

The Grey Mountain Copper Co. has been incorporated at Reno, capital $25,000; C. Stewart, E. E. Roberts, S. Platt, J. Richardson and J. B. Vieira directors. The company is to consolidate interests covering a number of claims near Reno. A tunnel will be run on the Stewart-Roberts ground, one of the claims.

The Nevada Con. M. Co. at Reno has started a new shaft and the workings are now down 45 feet.

The Willow Creek mine, near Washoe, has been sold to J. R. White for Eastern people for $15,000. The mine has been idle for a number of years.

NEW MEXICO.

COLFAX COUNTY.

The strike in the Bob Tall mine, near Elizahethtown, is greater than was first anticipated. Assays show 100 ounces of silver and 4 ounces of gold per ton. Development work is being pushed rapidly and the Smithfield M. Co., operating the mines, is figuring on the erection of a plant to handle the ore. F. Spurr is manager.

LINCOLN COUNTY.

A strike of gold and copper ore is reported made near Jicarilla by P. Miranda, and six men have been put to work. The lead is claimed to be 6 feet wide.

SIERRA COUNTY.

The Dude M. Co., operating near Hillsboro, expects to put in hoisting machinery and sink its shaft to a depth of 500 feet before doing any stoping.

A rich strike has been made by the Lake Valley M. Co. at Lake valley. The ore, it is claimed, assays 200 ounces silver from an average sample from a 4-foot breast.

O. D. Warnock of Alamogordo, Otero county, has bought a mining claim at Jarilla upon which he has made a find of a 20-foot vein by panning test of free gold showing from $30 to $60 per ton. An incline shaft has been started and will be sunk 200 feet.

The Prosper M. Co., recently organized to operate mines at Hillsboro, has commenced operations on the Prosper group with A. J. Hearst as general manager. It is the intention of the company to sink a shaft 1000 feet.

SOCORRO COUNTY.

The Last Chance M. Co. is erecting a cyanide plant to work over the hattery tailings. The plant will have a capacity of fifty tons. F. McKinley is chemist at the works.

OREGON.

BAKER COUNTY.

The Badger mine on Elk creek, near Susanville, is at an elevation of about 4300 feet. The country rock is slate. At present the rich ore is sorted and shipped to smelter. The developments consist of an incline shaft 250 feet deep, with drifts and tunnels aggregating 1500 feet.

JACKSON COUNTY.

It is reported that Ament Bros., who recently bought the Corliss mines in Dry Diggings district, near Grants Pass, are preparing a large hydraulic mining project—the building of a dam across Rogue river below their mines, gaining a 20-foot fall, and the installation of a battery of turbine wheels sufficient to furnish 3000

H. P., which it is proposed to use to pump 1200 miner's inches of water through a mile of piping to the mining grounds above. About 200 men will be required to put in the dam, and the whole plant is projected to be ready to be put into operation by the close of the coming summer. The plant will cost $160,000. Ament Bros. own 600 acres of placer mining ground.

GRANT COUNTY.

W. H. Jackson, Supt. of the Belcher group, near Alamo, states that P. A. Brady of Spokane, Wash., is making a thorough testing of the ores of the Belcher, and when the best process of treatment is decided upon a plant of 250 tons daily capacity will be installed.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Wasp No. 2 M. Co. of Deadwood has made a cleanup of $7000 from a 100-ton cyanide plant in the Yellow Creek mining district. The plant will be greatly enlarged in capacity this season.

The Homestake Co., at Lead, is pushing work on the second cyanide plant, which is intended to treat the tailings of the stamp mills on the north side of the Lead hill. The first plant, with a capacity of 1200 tons of tailings daily, is now saving to the company about $20,000 monthly, which amount was formerly lost in the tailings that went down the creek.

UTAH.

BOX ELDER COUNTY.

The Tyche M. Co. has been incorporated at Salt Lake City, capital $5000, with E. W. Wilson president and S. P. Armstrong secretary. The company owns the Great Halk mining claim in Johnson's creek canyon, an unorganized mining district.

IRON COUNTY.

W. J. Halloran and F. Wilson of Salt Lake City, owners in the Johnny mine at Stateline, report the mine as presenting an excellent appearance, with ten men blocking out large bodies of gold-bearing ore. Arrangements are being made for the erection of a 20-stamp mill to be installed about the first of May. W. J. Dooley is Supt.

A strike is reported in the Jumbo group of claims at Stateline, owned by Rice Bros. A body of gold ore yielding good values has been encountered. It is reported that a 9-foot vein of good ore has also been opened in the Margaret mine on the 60-foot level.

PARK COUNTY.

At the annual stockholders' meeting of the Daly-West M. Co. at Park City a resolution was passed authorizing the sale of the assets of the company to the Daly-West M. Co. of Colorado. The new corporation is capitalized at $3,000,000 and its officers are A. Hanauer president, A. C. Ellis Jr. vice-president and H. McCornick secretary and treasurer. J. E. Bamberger, president and manager of the original Daly-West, in his annual report says the past year shows a net gain of $200,000, of which $80,000 is in the treasury and $120,000 is represented by increased dividends. The report shows the total receipts as $1,115,568.11 and the expenditures, including twelve dividends, were $1,034,-050.67. The dividends aggregated $607,-500. The output of the year was 163 lots —32,097 tons of ore — which produced 1,326,448 pounds of copper, 15,586,973 pounds of lead, 1606.72 ounces of gold, 1,755,454 ounces of silver and 10,931,699 pounds of zinc. A recapitulation and summary of the year's work shows: Mill in actual service, 315½ days; ore milled, 57,773 dry tons; ore milled per day, 183 tons; concentrates produced, 12,926 tons; tons of ore concentrated into 1 ton of concentrates, 4½; per cent of lead saved, 92.8; per cent of silver saved, 70.2; present daily capacity of the mill, 225 tons.

SUMMIT COUNTY.

The annual report of the Daly-West M. Co. of Park City says that in the 57,773 dry tons of ore treated at the mill there were 3986 tons of pure zinc, 54% of which, or 2172 tons, was shipped to the smelter. In commenting on it F. W. Sherman, the mill Supt., says: "While this zinc, in conjunction with the lead concentrates, is only a detriment, yet, should the same be separated from the lead, iron and silica, the zinc in the year's crude ore would have a value of over $100,000, f. o. b. cars Park City. Already sufficient work has been done along the line of separating the zinc from Park City ores to prove that the same can be done successfully."

SALT LAKE COUNTY.

Development work is in progress at the Neptune-Kempton mine, at Bingham, and ore is being taken out. The mine is under a six years' lease and bond to E. A. Wall and associates.

The Tesora concentrator at Bingham, to which some additions were made recently under the direction of J. B. Fleming, is now running satisfactorily. About 100 tons of ore are treated daily, resulting in some thirty odd tons of concentrates.

TOOELE COUNTY.

The Mono M. & M. Co. has been incorporated at Salt Lake City, capital $50,000. The officers are G. A. Land president and E. L. Hall secretary and treasurer. The company owns a lease on the dump and old workings of the Mono and Star mines at Ophir.

UTAH COUNTY.

Locations have been made along a vein near Springville, northeast of Provo. The ledge is said to carry good values in silver, with some gold. W. Ferre claims he has discovered a 2-foot vein of galena on the face of the mountain near Provo.

WASHINGTON.

FERRY COUNTY.

The Hawkeye mine at Republic has its shaft down about 225 feet in solid ore of shipping grade. It is understood that negotiations are pending for the erection of hoisting machinery of sufficient capacity to handle 100 tons daily.

A strike is reported to have been made on the Summit, near Keller. At a depth of 42 feet the ledge is 6 feet wide and assays run as high as $100. The property is owned by the Silver Creek M. & M. Co., which is running a tunnel to get a depth of 300 feet.

LINCOLN COUNTY.

S. Noble has bought $1000 worth of placer mining machinery and is installing it upon a new placer discovery on the Columbia, 12 miles below Peach. The gold so far discovered has been extremely fine.

WHATCOM COUNTY.

Balfour, Guthrie & Co. of San Francisco and Evans, Coleman & Evans are preparing to erect at Whatcom a $1,000,000 plant for the manufacture of Portland cement. The firms named have bought 620 acres of land near Sumas which contains clay suitable for the manufacture of Portland cement. Constructing Engineer Cederberg is in charge of construction at Whatcom. The factory and clay works will employ 400 men the year round.

WYOMING.

CARBON COUNTY.

The Southern Wyoming Tramway Co. has let a contract to J. S. Carey for the immediate construction of an aerial tramway connecting the Ferris Haggerty group of mines with the Boston-Wyoming smelter at Grand Encampment. The tram will be 15½ miles long, and will be completed by August 1st. The Boston-Wyoming smelter is expected to follow its construction by being enlarged from a 100-ton daily capacity to a 500-ton daily capacity.

The Hidden Treasure M. & T. S. Co., operating at Battle, is reported to have cut a 50-foot vein of ore carrying copper, gold, silver and some nickel. Assays show it to run from $150 to $200 and over. This tunnel is now in 500 feet and a contract has been let for 200 feet more. H. M. Rice is general manager of the company.

FOREIGN.

BRITISH COLUMBIA.

J. P. Graves, manager of the Granby copper property at Grand Forks, B. C., says that while no definite plans have been formulated looking to the immediate establishment of a copper refinery, such is ultimately the intention of the company. There is no reason, he says, why the refining of copper cannot be done as cheaply, if not cheaper, than in the East. At least our company has determined to test the matter.

Two carloads of zinc ore have been shipped from the Bosun mine, New Denver, to Antwerp, Belgium, where, it is said, the most satisfactory treatment can be obtained for this class of ore. The Bosun has shipped ore there before and has made a profit out of the experiment. The ore runs 45% and upwards in zinc, besides silver values over eighty ounces to the ton.

It is reported that the Montreal-Boston Copper Co., owning the Sunset and the Crown Silver mines, has bought the Standard Pyritic Smelting Co.'s smelter at Boundary Falls. The purchasers are already arranging to add to the equipment of the smelter with the intention of commencing smelting within seven or eight weeks. It is stated that A. J. Goodell of Pueblo, Colo., will have charge under the new owner. A large new hoisting engine is now running at the Sunset mine, where preparations are being pushed to get an output to keep the smelter going.

Three copper smelters on Vancouver Island within a few miles of Victoria are building and to be in operation during this year. The smelter at Osborne bay is well in hand, the one at Ladysmith started, and P. O. Caesar of Tacoma, Wash., and P. Law of Seattle, Wash., who represent Baltimore, Md., people, have selected a site for a third smelter at Maple bay to treat ore from the Lord Roberts claim and that of the Yreka C. Co. on Mount Richards. Assays from the Lord Roberts claim give $8 gold and 17% copper. A 5x9 shaft is being sunk between the veins, each measuring 4 feet across, there being a distance of about 12 feet between the walls. The smelter company intend to erect their works at the foot of a cliff on the bay shore and will have water power from Somenos lake.

The British Columbia C. Co.'s smelter at Greenwood has completed its first year's work. The furnace was blown in on February 18, 1901, and with a short stoppage — about nine days in August for necessary repairs—it has been in continuous operation and has smelted 138,139 tons of ore, or an average of 378½ tons daily. Its present average is higher, the run for the first forty-eight days of 1902 having averaged 428⅜ tons per day. P. Johnson is Supt. of the smelter.

C. R. Leonard of Butte, Mont., has been elected president of the Brittannia C. M. Co., operating on Howe sound, near Vancouver. G. H. Robinson, T. M. Hodgens and F. M. Leonard, also of Butte, Mont., have been elected directors.

MEXICO.

H. R. Thomas of Chicago, Ill., representing the Gold Coin M. Co., has bought the Bogan and Pesquira gold mines, in Guijas district, near Arivaca. The ore averages from $5 to $10 per ton and is free milling. D. S. Cochran is manager.

TRANSVAAL.

The first batch of natives from Mozambique has arrived at Johannesburg to work in the mines. Permission has been granted to mines to resume crushing in the following order: The Village Main Reef, Reitfontein A, Robinson Deep, Lancaster West, New Goch, New Primrose, Simmer & Jack, Jumpers Deep, Glencairn and Knight's. All are expected to start by the middle of April.

Personal.

JOHN B. FARISH, of Denver, Colo., is in London.

WILLIAM FARISH, of Denver, Colo., is at Kendall, Montana.

I. MCKAY of Park City, Utah, is now located at Tonopah, Nev.

J. H. HALL is Supt. of the Campo Seco mine near Jamestown, Cal.

A. B. THOMPSON is Supt. Deep Blue Jupiter mine at Dogtown, Cal.

A. F. DEAN, of Redding, Cal., is sojourning in San Francisco, Cal.

W. H. JACKSON has been appointed Supt. Golconda mine, Alamo, Or.

D. B. GILLIES of Butte, Mont., is sojourning at Salt Lake City, Utah.

H. L. VAN EMON of San Francisco, Cal., is sojourning in Salt Lake City, Utah.

MAX BOEHMER, M. E., Denver, Colo., is at Butte, Mont, on professional work.

H. D. OTTE has resigned as foreman of the Grand Mogul M. Co. at Silverton, Colo.

A. J. HEARST has been appointed general manager of the Prosper M. Co. at Hillsboro, N. M.

J. COPLEY is now Supt. Mack mine, at Big Oak Flat, Cal. T. Coyle has been appointed foreman.

G. W. CROWE, manager of the Arizona G. & C. Co. at Patagonia, Ariz., is in Guaymas, Mexico.

W. BIELEFELDT has been appointed Supt. of the Green Mountain M. & M. Co. at Silverton, Colo.

F. SPURR is manager of the Smithfield M. Co., operating the Bobtail mines, near Elizabethtown, N. M.

D. S. COCHRAN has been appointed Supt. Bogan & Pesquira gold mines, near Arivaca, Sonora, Mexico.

T. P. ROHLFING, formerly Supt. Horn Silver mine at Frisco, Utah, is now experting properties in Wyoming.

A. J. PAYNE, manager of the Buffalo-Golden Gate M. & M. Co. at Buffalo Hump, Idaho, is in Philadelphia.

O. O. SAXHUNG has been appointed assistant manager of the Sonora M. & M. Co. at Tubutama, Sonora, Mexico.

A. BOHN, of Leadville, Colo., is in the vicinity of the City of Mexico, Mexico, examining some mining propositions.

S. D. PIERCE, manager of Old Terrible M. Co., Cochise county, Ariz., has returned from a trip to Boston, Mass.

H. VAN F. FURMAN, of Denver, Colo., has made arrangements to represent a large German mining syndicate in Mexico.

T. SINGLETON of Glasgow, Scotland, managing director of the Crystalline mine near Rawhide, Tuolumne county, Cal., was at the mine for several days last week.

W. H. HALL, C. E., of New York, is in Sonora, Cal., engaged in examining a power proposition on the Stanislaus river.

ARTHUR L. PEARSE has returned to London after a lengthy tour in Korea and China, where he has been examining mines.

H. P. GALLIGAN, Supt. Galvin Dredging Co., at Weaverville, Cal., has gone to Callahan's, Siskiyou county, to start up a new dredger.

J. M. BECKWITH, formerly manager of the Silver King mine, Calico, Cal., is now manager of the Becerrea mines, Lugu, Galicia, Spain.

A. MCNAUGHTON of the Beatrice M. & M. Co. of Elliston, Mont., is in St. Paul, Minn., to confer over plans for a mill on the property.

C. T. DURELL is Supt. of all the mines of the Central Montana Mines Co., including the properties at Spotted Horse and Kendall, Mont.

N. C. RAY of Coulterville, Cal., is engineer for the Mariposa Electric & Power Co, which is building a power plant on the Merced river, Cal.

C. S. COWAN, formerly assayer at the Afterthought mine, Trinity Co., Cal., is now in the assaying department of the Anaconda Copper Co., at Butte, Mont.

HARRY K. WHEELER, formerly with Capt. De Lamar and later at Sumpter, Or., has located in Los Angeles, Cal., where he will practice his profession of mining and civil engineer.

W. L. HONNOLD, formerly of Calaveras county, Cal., goes to Johannesburg, South Africa, via New York City and London. He will act as consulting engineer for the Con. M. Selection Co., Ltd.

R. A. JONES has resigned as master mechanic of the Dalton & Lark mines, at Bingham, Utah, and has associated himself with C. D. Hitchcock in mechanical engineering in Salt Lake City, Utah.

Commercial Paragraphs.

PROCTOR PATTERSON, general manager of the W. S. Tyler Co. of Cleveland, O., has been in the Southwest looking over business in the interests of his company.

THE Link Belt Machinery Co. of Chicago have contracted to furnish two of their latest pattern placer mining dredgers to the Zaragoza Mining Co. of Zaragoza, Colombia, South America.

S. W. TRAYLOR is the manager of the New York City office of the Colorado Iron Works Co. of Denver, Colo., at 25 Broad street. In addition to the general office is provided an engineering department.

THE Pacific Coast Rubber Co. has moved to the new Crocker building, Nos. 453 and 455 Mission street, San Francisco, Cal., where a large line of rubber hose, belting and asbestos metallic packing is carried.

E. T. HEWITT AND GEORGE DILLMAN, under the firm name of the Hewitt & Dillman Mine Supply Co., have opened an office at room 610, 330 Market street, San Francisco, Cal., their chief business being the supply of shoes, dies, etc.

THE E. H. Stroud Co. of Chicago are now the sole American agents of the Cyclone pulverizer, a machine that has done good work in Europe and other countries. Several of the pulverizers are now in operation in the United States.

THE J. H. Parsons Chemical Co. of Chicago, manufacturers of boiler compound, have recently greatly improved their laboratories and are better prepared than ever to examine waters sent them by their customers and intending customers. This company are making a specialty of treating boilers at mines and smelters, and have a large clientage among these industries.

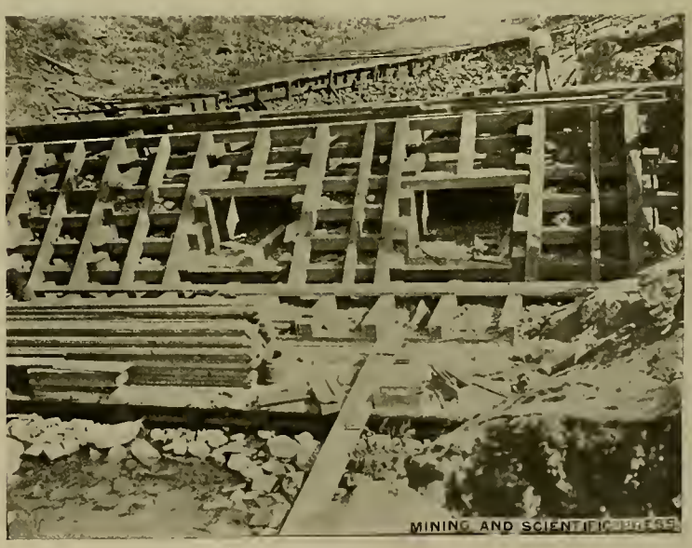
THE firm of Griffin & Cameron, general contractors and builders of gold dredgers, has been organized. The firm is oomposed of F. W. Griffin, M. E. Griffin and D. P. Cameron, with offices at 209-210 Safe Deposit building, 328 Montgomery street, San Francisco, Cal. They are Pacific coast representatives The Bucyrus Co., South Milwaukee, Wis., and the Robins Conveying Belt Co., New York City.

THE new shops of the American Engineering Works at Chicago are now in full operation, these shops being equipped with latest machinery. The American Engineering Works manufactures the Overstrom diagonal concentrator, mine cars, stamp mills and other mining machinery. Orders received to date on the Overstrom table are reported sufficient to keep the concentrator table department busy for months.

THE W. S. Tyler Co. of Cleveland, Ohio, are extending their business in

MINING AND SCIENTIFIC PRESS.

Whole No. 2172.—VOLUME LXXXIV. Number 10. SAN FRANCISCO, SATURDAY, MARCH 8, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.



Melones Mining Company's Dam and Flume, Robinson's Ferry, Stanislaus River, Cal.—(See Page 126.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 4 50

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

☞ MR. GEO. S. SCOTT is now our Chicago representative, office 737 Monadnock Bldg., Chicago, Ill., and is authorized to transact business on behalf of the MINING AND SCIENTIFIC PRESS.

San Francisco, March 8, 1902.

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OF late years suggestions and requests of subscribers and advertisers for a change in the form and appearance of this publication have been frequent. In accordance therewith, a change will be made in its "make-up," embodying the principal points so embraced. For nearly forty-two years the MINING AND SCIENTIFIC PRESS has been appearing in its present shape. The arrangement of the contents of each issue will be in different form throughout, which, we trust, will be to the greater value and convenience of our patrons everywhere.

GAS ENGINE MOTORS, which have an extended and satisfactory use in Europe and the Eastern States, may soon come naturally under consideration for installation in the mines and other industrial establishments in the West. This result is likely to follow as a consequence of the development of the petroleum industry in California, Colorado and Utah. In all three States the transportation of the bulky petroleum by rail to the point of consumption is the chief item of cost and tends to limit the use. The direct use of crude petroleum for fuel, particularly in cities, also has some disadvantages. Projects to gasify the petroleum at the wells and to send the gas, compressed, through pipe lines to distant markets are being considered in connection with the new petroleum deposits, and will eventually be consummated. The petroleum gas fuel will, however, be available directly as a prime mover used in what are described as gas engine motors. By their use there would appear to be possibilities of economies in the operation of many plants, and, it can be added, a further extension of the use of power. Services for which it is now regarded as too costly, and which, therefore, are not undertaken, become possibilities with the lowering of power costs.

MORE than the usual winter's tale of placer strikes in new and old localities is now coming out from Alaska and the Yukon. While they are surely occasioning stampedes of the prospectors and miners who are in the country they will create no rush from the outside. Rich placer strikes announced in the winter have so frequently failed to materialize in the spring that reports of them no longer inspire the adventurous crowd. This time, though, there is reason to believe that the reports fairly represent the facts. They are not particularly extravagant in the claims made and the discoveries are located where there has been reason to anticipate them. The discovery of a so-called second bedrock in some of the Klondike claims is not a novel feature in placer mining, and it is well known that much of the early mining there was careless and overlooked very large gold values in from 2 to 4 feet of shattered surface bedrock on which the gold-bearing gravel rested. The discoveries back of Porcupine district were really made in the summer of 1898, but were turned down then because they were not extraordinarily rich like the Klondike placers. The Kuyukuk and Copper river placers are the natural development of persistent prospecting in regions already known to be gold bearing. They are all worth the attention of the prospector and miner.

Mine Taxation in Colorado.

The contest in the Colorado Legislature over the taxation of mines has been settled temporarily by the adoption of a rule of taxation, by which producing mines are to be taxed at a sum not to exceed the net output of the preceding year, and non-producing mines at 25% of the gross output of the lowest producing mine in the county.

The reports that have come to hand state that the rule is the choice of the miners and meets with their approval. While this is probably true at this time, it is at least doubtful whether their approval will be lasting, and it is highly improbable, when it is closely studied, that it should be regarded as finally removing the question from consideration as being something finally settled.

It is assumed that where the language of the Act says, "taxed at a sum not to exceed the net output of the preceding year," it means "assessed at a sum, etc."—the assessment value so determined to be the basis of taxation. If a definition of "net output" were made part of the law; if, as in the Montana law, this net output so defined was made the assessment valuation without the proposed qualification of the Colorado Act where the words "not to exceed" are employed; and if the Act as in Montana were to declare a definite percentage of the net output to be the tax; then the law, judging from the experience of Montana, would settle the question. But the Colorado Act is not a copy of the idea of the Montana law, but is designedly indefinite and uncertain where the latter is definite and certain.

The proposed Colorado Act would seem, in addition to the indefiniteness referred to above, to contain a new provision of doubtful value in the rule set up for the taxation of mines that are not producing. By not producing, it is assumed the Act means, not producing a profit. But why should the gross output of the lowest producing mine be the basis of estimation rather than the net output of the lowest producing mine? Why the gross output of the lowest producing mine rather than the gross output of the highest producing mine? One part of this clause has the merit of definiteness, the rate of assessment shall be 25% flat without any discretion allowed to an assessor. Consider a possible case of taxation under this Act. Suppose that at Leadville a mine makes 500 tons of $3.50 ore a day and at the end of the year shows a gross output of $542,500 and a net output of $2500, and that every other mine in Lake county making a net output made a larger net output than $2500. Then under the strict application of the Act this producing mine could not be assessed at more than $2500, its net output, and every non-producing mine in Lake county would have to be assessed at 25% of $542,500, or $135,625. This will be said to be an extreme case, but it is a possible case, and it is the extreme cases that show the weakness of rules.

It is perfectly practicable to frame and apply a just and equitable rule for taxation of mines. The Montana law is such a rule. To begin with, there must be a clear, intelligible definition of the thing which is subject to taxation. A mine is property, certainly. But what is a mine? It will not require much consideration to see a distinction between a mine that is property in the tangible, legal sense and a mine that is not property in such a sense. The first kind of a mine that is really property is the mine that has a measurable quantity of ore in sight that can be appropriated to produce a value to the appropriator. A value for it is the quantity of the excess output over its cost. The other kind of a mine is a creature of the miner's imagination. Though perhaps realizable, it is not real. The miner hopes and believes he has a mine and uses the word as if he had. What he really has is merely the right to get the mine if it exists. While the miner has the right to believe he is going to have a mine, and to sell his belief to another miner, the belief is no more a taxable entity than is the good will of a corner grocery. What is taxable in the grocery is not the belief of the proprietor as to the future profit of his business, but the stock of goods in his store. When it comes to taxation of the corner grocery the two things are not confused. There is no reason why the two similar things should be confused in determining what kinds of mines are property that is taxable and the kinds of mines that are property that is not taxable.

If such a clear understanding of what kind of a mine, and it might be added, what part of it was real and tangible property, subject to assessment and taxation, were made the beginning of legislation on mine taxation, the establishment of an equitable rule would not be difficult of formulation and establishment. The effect of it would be to relieve from taxation locations, prospects and undeveloped or unprofitable holes in the ground. It would put it on mines capable from ore in sight of making a net output and would not measure it in excess of that net output. The Montana law makes a fixed per cent on actual net output, the reasonable equivalent of what is defined above as the estimatable net output.

The preceding is not suggested as a substitute for all taxation on the things that are part of a mining property. Land has a value as land independent of the mineral; it may be very little, but it is something. Machinery and tools have a value independent of the particular mine they are in use on. It may be but a fraction of their cost, but they are worth something. These things could be accepted to pay just debts. They are real things, equitably taxable at the values as such, not at what they are worth as part of a particular mine plant. Dead work is not a real property, it cannot be separated from its situs as personal property. It has no value by itself. It is a mere evidence of part of the cost of mining. It is not taxable property. What the preceding is intended to suggest is, that the proposed Colorado law of mine taxation will not really tax mines that are real property that is equitably taxable, but will tax what are really not "mines" at all, but are only "rights to make mines," which, though property, are not the kind of property that is equitably taxable, or on which as between different individual rights, taxation by the proposed law can be made equal.

STOCK in a mining company, which claims to be doing something at some place not definitely stated, out in the desert in Riverside county, Cal., is being advertised in a prospectus that is a gem in the inducements it offers to people to become stockholders. It states that the stockholders are owners in a lot of engines, boilers and other machinery, a drug store, harness rooms, 160 acres of land, of which forty acres are enclosed with a barbed wire fence and used as a pasture for the company's mules, a cottage, bunk house, corral, all buildings being substantial and modern, horses, mules, burros, stages and wagons, oil lands, sandstone quarries, gypsum beds, iron claims, many good roads and trails, a spring of soft water, more than the mills can possibly use, and five acres of a vegetable garden. It adds that the company has no saloons at the mines, does not allow liquor, beer, gambling or dance houses on the grounds and employs quiet and peaceable miners. Evidently the promoters think the inducements offered will sell the stock like hot cakes, else they would have spoken of the mines that the company proposes to work as at least an incident of the proposition. Of course, there are mines of some kind somewhere in the plans of the company promoters, but the prospectus is silent concerning them. It does not say whether they are gold, silver or some other metal. The "ore" is not referred to at all, nor is there any mention of prospective dividends. It is possible, however, that the promoters are only trying to tell the truth. It is quite possible that they are not sure about having a mine, or that there will be dividends, but are sure of the mules, the spring of soft water and the five acres of vegetables. Not desiring to deceive an investor in the mining stock, they are only offering to sell him what they are sure he will get for his money—a share in the mules, the drug store and the spring of soft water. The prospectus is a work of art that is artless. The stock is only 50 cents a share, and there is so little of it left that the promoters say the advertisement will not appear again. Really, the buyer of the stock on the representations of the prospectus will never be able to say that his mining investment is a failure.

Concentrates.

AMALGAM is an alloy in which mercury is one of the components.

THE gauge of ordinary steel and iron wire is the same as that of copper. Piano wire has a gauge of its own.

AN engine of 40 effective H. P. can pump 4000 cubic feet of water from a depth of 365 feet in seventy minutes.

SILVER 71.89%, copper 28.11%, gives an alloy that has a lower melting point than other silver-copper compound.

A ¾-INCH NOZZLE, under fifty-two pounds pressure per square inch, will discharge 13.43 gallons of water per minute.

POWDERED ANTIMONY or heated copper foil will burn with an evolution of light if dropped into a jar of chlorine gas.

ONE THOUSAND gallons of water per hour constantly flowing under a 6-inch pressure is equal to 1¼ inches, miner's measurement.

THE average cost of gold dredging may in a general way be stated to be approximately 4½ cents per cubic yard of material handled.

A FLOOR for a smelter furnace room can be made of a concrete composed of Portland cement, sand and furnace slag in lieu of natural rock.

A GOOD BASIC LINING is furnished by the following composition: Magnesia, 36%; lime, 52%; silica, 8%; alumina, 2%; oxide of iron, 2%.

THE abandonment of a mining claim cannot be presumed, but must be of such a nature that it can be clearly established by evidence before a court.

TO FIND quantity of water elevated in one minute running at 100 feet of piston per minute, square the diameter of water cylinder in inches and multiply by 4.

A TRANSPARENT etching ground for retouching can be made by mixture of the following ingredients: Retouching varnish, Sandarac, 1 ounce; castor oil, 80 grains; alcohol, 6 ounces.

IN northeastern Utah is the only deposit of ozokerite known to "Concentrates." The pending exhaustion of the Galician ozokerite mines makes manifest the possibilities of coming profit from the development of the Utah deposits.

PLATINUM is 21½ times heavier than an equal bulk of water; gold, 19.32 times; lead, 11.37; copper, 8.82; iron, 7.86; antimony, 6 71. Platinum melts at 1775° C.; gold, 1045° C.; lead, 327° C.; copper, 1050° C.; pure iron, 1600° C.; antimony, 425° C.

IN a tank 10 feet diameter at the top, 12 feet diameter at the bottom, 12 feet deep, fed by a pump discharging 150 gallons water per minute, and having when pump is started a depth of 2 feet of water, it would take forty-six minutes to fill the tank.

THE average efficiency of the incandescent carbon filament electric light is from four to five watts per candle power, and its average life is less than 400 hours at this mean efficiency. This is the equivalent of 9.3 to 11.7 16 C. P. lamps per H P.

THE new smokestack at the Selby Smelting & Lead Works, Selby, Cal., is 180 feet in height. The tallest chimney in the United States is that of the Oxford Copper Works, New Brighton, Staten Island, N. Y.—365 feet in height above the ground.

WHERE a vein is discovered in driving a tunnel at a point 250 feet below the surface, a valid location of the claim can be made by marking the boundaries on the surface at the place at which the vein, if continued to the surface, would be discovered.

MINE LOCATIONS in California are assessed as possessory claims and the taxes, when collected at all, are collected as taxes on personal property. A sale to the State for unpaid taxes conveys no title to the State in the land of the mining claim, which is public land of the United States.

WIDE TIRES are all right for earth roads, and, to some extent, for macadam roads. When tires exceed a certain width, however, they are likely to bear unevenly, the weight being thrown first on one edge and then on the other, as the wheels pass over the more or less uneven surface of the road.

A CORRECT "average assay" may be obtained as follows: Multiply the weight of each lot of ore by the assay of such lot, add the products of such multiplications and divide this sum by the sum of the weights of the various lots of ore; the quotient of such division will be the average assay required.

BY DRYING at 100° C. all the moisture in wood may be expelled, but on subsequent exposure to the air at the usual temperature the wood will reabsorb from 18% to 20% of water. Wood inflames at a temperature of 300° C. in the presence of oxygen or air. Wood will weigh five times as much as the charcoal produced from it.

A MILLSITE PATENT gives a valid title to any mineral deposits, lode and placer, that may be discovered after patent issues. The lodes discovered subsequent do not take extralateral rights. The grant of the patent is not of a lode mine but of a tract of land bounded by vertical planes. A subsequent discovery of a mine not granted does not confer a purely mining right outside of those boundary planes. A lode discovered on the patented millsite is not subject to location on the millsite. The lode is locatable outside of the lines of the millsite patent, and the apex line for such a location must be the line of the millsite patent that the lode dips under.

REVISED STATUTES OF THE UNITED STATES, Section 2323, and privileges granted therein, apply to one locating a tunnel for discovery and developing purposes, but failing to prosecute work thereon for six months is an abandonment of the right to all undiscovered veins on the line of the tunnel, but not the bore of the tunnel.

SODIUM AMALGAM consists of one part of metallic sodium and thirty parts of mercury. It is liquid at a very moderate heat, but solidifies on cooling to a hard crystalline mass. It is cast into ingots which are kept in air-tight iron vessels with lime to absorb any moisture, which would act upon the sodium in the amalgam and convert it into soda.

MINING MACHINERY MANUFACTURERS gladly accord every facility of information to probable or possible customers, furnishing considerable preliminary technical knowledge of material value in the effort to secure business. Indeed, in many instances the gratuitous service so rendered might be rightly regarded as expert engineering work, for which a fee might with propriety be forthcoming.

BY adding arsenic to copper, in the proportion of one to ten, a white malleable metal is obtained not easily tarnished by air and much harder than copper. This alloy is employed for fine clock dials, for thermometer and barometer scales, and is made by heating in a covered earthen crucible five parts of copper clippings with two parts of arsenious acid, arranged in alternate layers and covered with common salt.

IN building flumes in dry weather the condition of the board lumber used should be noted. If dry and seasoned it should not be nailed to make close joints. An allowance should be made for the swelling of the boards when they become wet. Partly seasoned lumber or even lumber green from the saw can be used for flume construction. When battens are used in the boxes it is best to nail only one edge till they have been well soaked up by the flowing water.

A MATTE suitable for converting should not contain less than 45% copper, or the proportion of iron would be unduly great, would lead to the production of an unmanageable bulk of slag, and the siliceous lining of the converter would be severely attacked by the oxide of iron formed. Nor should it carry more than 60% of copper, or there would be insufficient sulphur and iron to provide the necessary heat by oxidation. From 50% to 55% is usually preferred.

IN the case of Muldrick vs. Brown, as reported in 61 Pac. Rep., the decision of the court was that under Rev. St. U. S. Sec. 2320, requiring the discovery of a vein or lode within a quartz claim before any right can be acquired thereto, it is enough to entitle the discoverer to protect his mining rights if ore or metalliferous rock be found in place sufficient to warrant a prudent man in spending time and money on it, though it may not contain ore in paying quantities.

TRUE GRANITE is composed of quartz, mica and feldspar. Granite with black mica or biotite is commoner than with white mica or muscovite. The quartz is distinguishable by its gray, crushed, translucent appearance, with no crystalline face or form. The feldspar usually shows a part of one flat face of the glistening crystal. The mica is easily recognized by its bright glitter and color. Hornblende, when present, is indicated by a duller luster than mica, a greenish black tint and longer crystals.

THOSE "Concentrates" to the number of about 3000 per year are mainly answers to questions on every conceivable subject connected with mining, metallurgy and engineering weekly received from readers. To publish the questions themselves would weekly take several pages, but an attempt is made in every issue to give on this page a condensed correct answer, briefly worded, where the subject is of sufficient importance to be a matter of probable information to many others beside the individual questioner.

THE removal of a posted notice of location from a mining claim, and the substitution of another for it, with other parties as the locators, does not divest the parties who posted the original notice of the rights that the law vested in them through making the claim. Presuming the original posted notice to have been made in conformity with the law so as to constitute a legal location of the claim, the parties who removed it and substituted their own notice of location are trespassers. Some of the States have statutes making it a misdemeanor to remove or destroy corner monuments.

DIRECT-CURRENT motors are usually wound for 110 or 220 volts for general service, and in exceptional cases, where a higher voltage is admissible, 500 volts are employed. The construction of the induction motor being more advantageous for higher voltages than those for the direct-current motor, it follows that higher voltages may be safely employed. The 200 and 400-volt induction motors are in general use where 110 or 220 volts would be employed if direct-current motors had been used. For higher voltages it will often be found that the conditions which would make 500 volts direct-current allowable will permit the use of 1000 volts for alternating-current motors. In this way a decided advantage is given to the alternating-current motor in the point of economy in the conductors for supplying the current. For power work only, the three-phase system would be selected, as it would effect a saving of 25% in line copper. Where light and power work are combined, the two-phase system would give the best results.

DRY COAL DUST by itself is claimed to be non-explosive in a coal mine. This contention is based on experiments which show that it will not explode by contact with an ordinary flame, such as a miner's lamp or candle, or a blasting powder fire. The active agent in causing the explosion of the powdered coal is said to be the presence with it of marsh gas or the mixture of explosive gases known as fire damp. Possibly the power carbon has of absorbing gases may have part in forming an explosive mixture. Wetting down the coal where it is to be shot is claimed to decrease the chances of an explosion of the powdered coal.

IN the scorification method of assaying a small charge of the powdered ore sample is weighed and mixed with eight or ten times its weight of test lead, in a shallow fire clay dish called a scorifier, covered with another eight parts of test lead. The scorifier is then set in the hot muffle, where the lead first oxidizes and fuses with the ore, then the excess of lead oxide reduces and takes up the precious metal which alloys with the lead. When the reaction is completed the contents of the scorifier are poured into a mold and the lead bullion button is separated and treated by cupellation exactly as in the case of a crucible assay.

A GOOD FLUX for lead assaying must be readily fusible to protect the lead from volatilization; it must contain excess of carbon; the amount of borax present must not be excessive, otherwise lead will tend to pass into the slag chemically combined as a borate; it must act as a desulphurizer. The following makes a good lead flux: Bicarbonate of soda, 16 parts; carbonate of potash, 16 parts; borax glass, 8 parts; flour, 5 parts. Where used in the proportion of three of flux to one of ore, with a salt cover and two iron nails in the charge, it will be found ordinarily to give satisfactory results in the case of oxidized or sulphide ores.

REGARDING the posting of mining applications, the claimant is required to post a copy of the plat of survey in a conspicuous place upon the claim, together with a notice of his intention to apply for patent therefor, date of posting, name of applicant, name of claim, mining district and county, whether or not the location is of record and, if so, where the record may be found, giving the book and page thereof, the number of feet claimed along the vein and the presumed direction thereof, number of feet claimed on the lead in each direction from point of discovery or other well-defined place on claim, names of all adjoining and conflicting claims, or, if none exist, the notice should so state.

THE Supreme Court of Idaho, in Hall vs. Blackman, has ruled that in Idaho prescriptive right to the use of water cannot be acquired by the use thereof with the consent or permission of the owners, and as under the law of the State it is made a misdemeanor for one who has the right to the use of water to waste it, and the law requires him to permit it to flow down the stream in case his necessities for the time do not require its use, it is made by the law difficult to acquire a prescriptive right to the use of water. For, if the law requires the one entitled to the use of water to let others use it in case he may not for the time need it, they may have its use under the provisions of the law, which commands the consent of the owner.

THERE is always a loss of pressure in an electric current when it flows through a conductor, the loss being equal to the product of the resistance of the wire and of the amperes of current. Then when a number of incandescent lamps are fed from a circuit at a considerable distance from the supplying source, the wires of the circuit must naturally be quite heavy in order that the loss in pressure shall not be too great. On an incandescent lighting circuit it is common to allow a loss of pressure or drop amounting to as much as 10%—sometimes even as high as 20%—when working at its full capacity. The circuit should be so arranged that all the lamps on it shall be fed with current at as near a uniform pressure as possible, and, if the drop allowed is too great, this becomes a difficult matter, on account of the continual change in the amount of current flowing as a result of lamps and motors being turned on and off the circuits.

THE horse power capacity of a boiler may in use prove to be greater than its rated capacity, though more often it proves to be less. If it can be made to evaporate more water in a given time than rated for, its capacity is correspondingly higher. This increased capacity may show itself in the ability to produce its rated quantity of steam at a higher pressure than its rated pressure, which means a higher temperature for the steam and a larger amount of heat received by the same quantity of water than estimated for in the rating. That is, the boiler may make a gain on its rated horse power efficiency, either by providing more than the rated evaporation at the rated pressure, or by providing the rated evaporation at a higher pressure than the rated pressure. It must not be overlooked, however, that where the use of the steam a boiler makes is not constant it stores itself up and the boiler pressure rises. This does not mean increased boiler efficiency, however, and must not be confused with it. The higher pressure of steam in the engine gives the latter a larger output of horse power when it is in use. A boiler should not be run at higher than its rated pressure.

The Melones M. Co. Dam, Stanislaus River, Cal.*

The Melones M. Co. of Boston, Mass., William C. Ralston of San Francisco, Cal., manager, which is operating the Melones quartz mine at Robinson's Ferry, Calaveras Co., Cal., has during the past year built a part of the power plant to supply power to the mill, a frame dam in the Stanislaus river. Accompanying this are reproductions of the plan of the site of the dam and of a plan and elevation of the dam proper, the design and construction being in charge of L. F. Warner, Jr., C. E. On the front page are views of the dam construction at several stages, and of the flume leading from the dam to the mill.

Preliminary work for the dam was commenced on August 1, 1901. Construction on diversion flume commenced August 15th, construction of dam started August 29th, and the gates were closed and dam filled on October 8th—forty-one days actual construction.

It was impossible to reach bedrock clear across the river without great expense of pumping, so a space 55 feet in length in the center of the dam rests upon boulders and gravel.

The dam is constructed on crib plan, cribs being 8 feet square of 10x10-inch square timbers (ordinary pine), drift-bolted together with ¾-inch round iron 14 inches long. Every sill which came in contact with the bedrock was drift-bolted to it with 1-inch round iron.

Lumber used.....284,467 feet

* See illustration herewith and on front page.

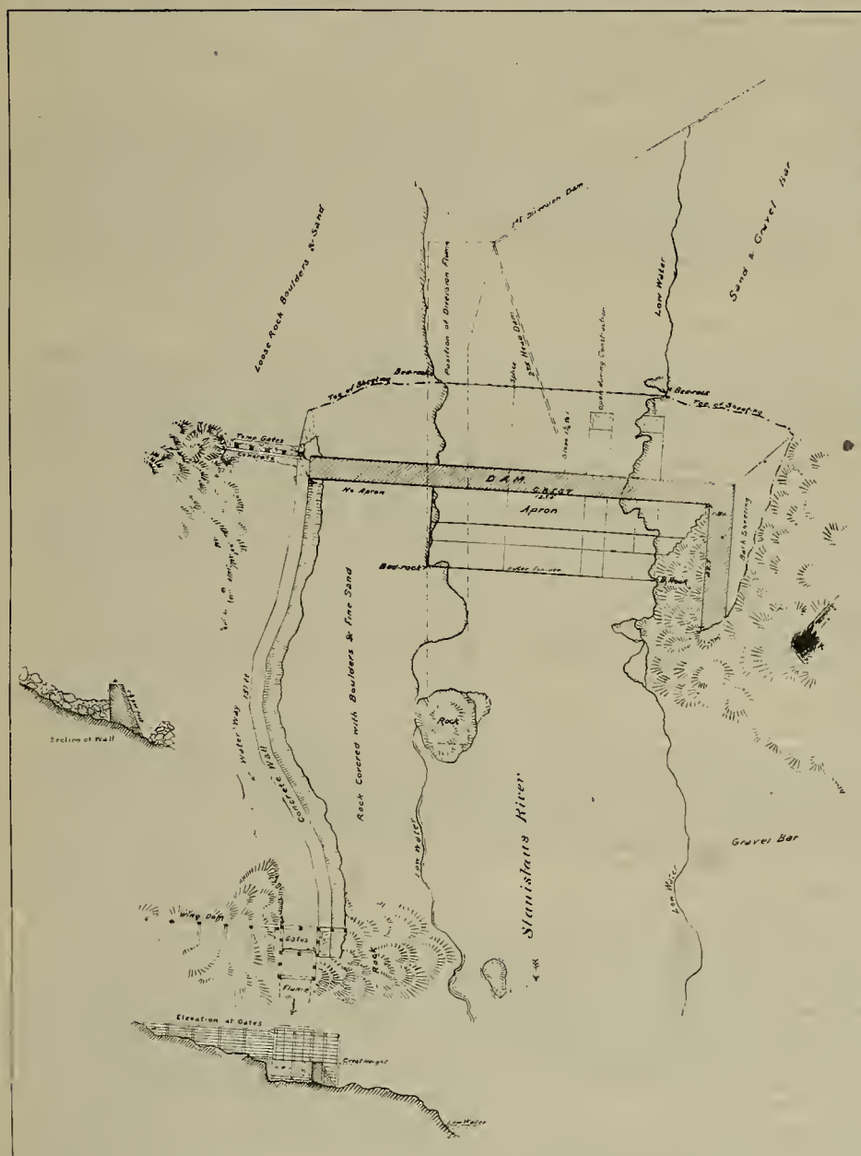
Cost of lumber	$ 5,502 21
" labor	8,423 93
" supplies (including packing on mules)	1,620 82
Total cost	$15,546 96

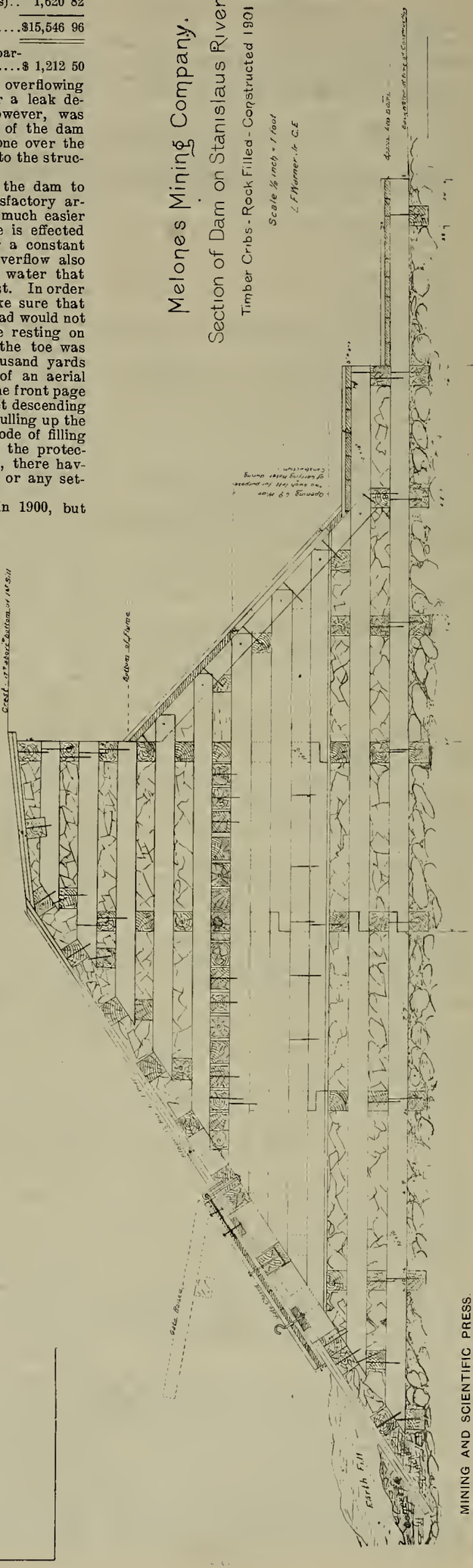
Cement (concrete wall for water way), 242½ barrels at $5 ..... $ 1,212 50

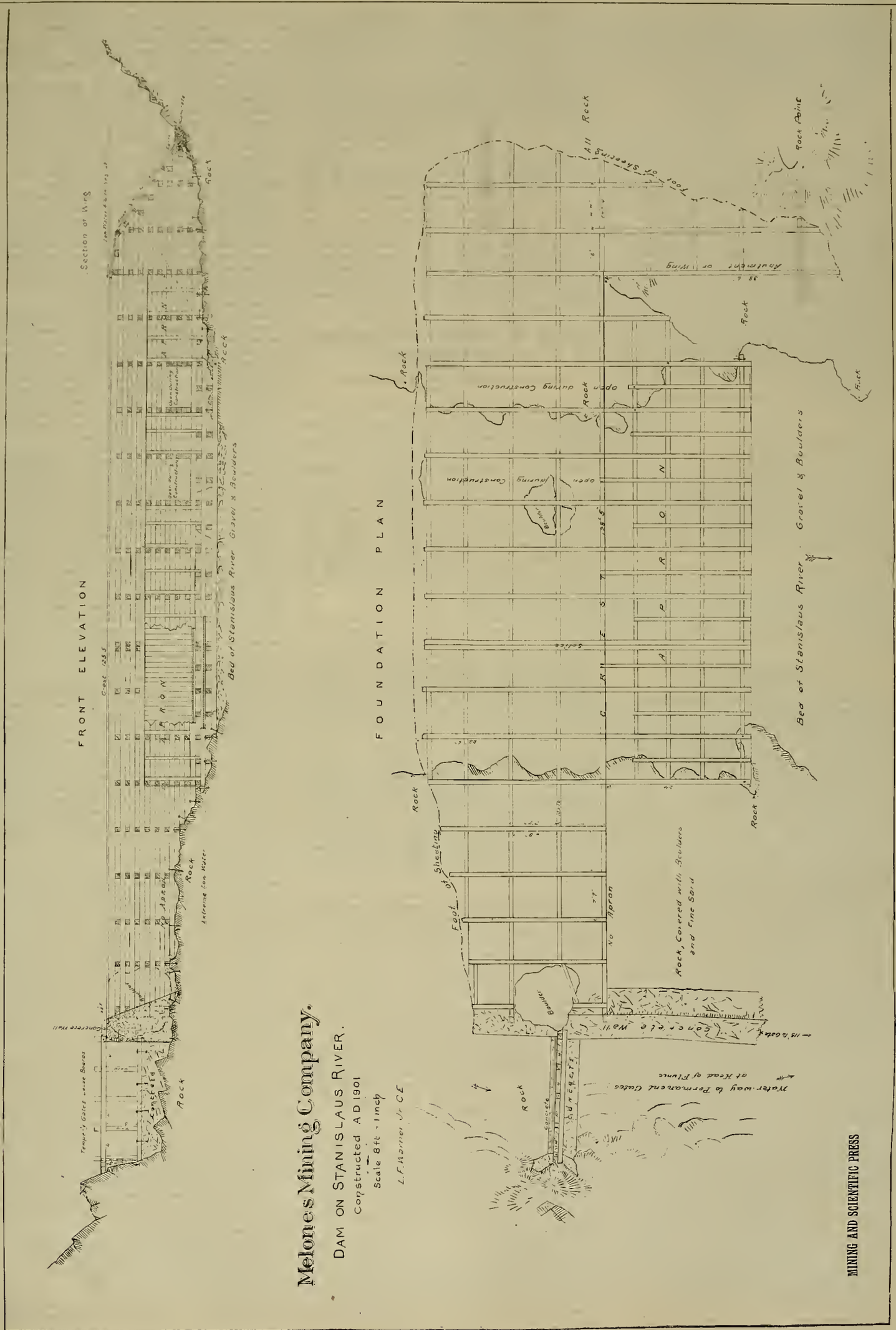
After the dam had remained full and overflowing for thirteen days, on the 21st of October a leak developed through the gravel which, however, was soon stopped by filling in the upper side of the dam with earth and rock. The water has gone over the crest 5 feet in depth without any injury to the structure appearing.

The concrete waterway leading from the dam to the headgate is found to be a very satisfactory arrangement for taking the water. A much easier regulation of the flow through the gate is effected through the long wall overflow keeping a constant head at the gate. The concrete wall overflow also relieves the dam proper of some of the water that would otherwise be turned over its crest. In order to protect the toe of the dam and to make sure that water under the pressure of the dam head would not get under the portion of the structure resting on gravel, the entire back of the dam at the toe was filled in with clay and rock, several thousand yards being deposited there by the carriers of an aerial tramline. This line is shown on one of the front page illustrations. It was double, a full bucket descending on one line by gravity from the hillside pulling up the empty bucket on the other line. This mode of filling was found to be exceedingly cheap and the protection to the dam afforded by it is perfect, there having so far been no signs of undercutting or any settlement of the crest line.

From the site of the dam started in 1900, but




Melones Mining Company.
Section of Dam on Stanislaus River.
Timber Cribs - Rock Filled - Constructed 1901
Scale ½ inch = 1 foot
L F Warner Jr C.E
Earth Fill
MINING AND SCIENTIFIC PRESS.


FRONT ELEVATION
FOUNDATION PLAN
Section of Wing
Rock
Bed of Stanislaus River Gravel & Boulders
Concrete Wall
Rock
Rock
Rock

abandoned through early fall storms bringing high water stages into the river before construction was fairly under way, there was during 1901 constructed an additional 6080 feet length of flume to the dam described above. The entire line from the dam to the wheel pit at the mine consists of:

Length of flume construction			16,864 feet
"	" tunnel	"	758 "
"	" ditch	"	816 "
Total			18,438 feet = 3.49 miles
Lumber used in construction, board measure			1,455,000 feet

The portion of the flume constructed in 1901 was 654 boxes (10,462 feet), 8 feet wide inside by 4 feet deep, increasing the size 1 foot in width over the old flume.

The flume is built of ordinary mountain pine, dimensions of the lumber used being: Bent posts, 8x8 inches; caps, 6x8 inches; stringers, 6x8 inches; sills, 6x6 inches; posts, 4x6 inches; caps, 4x6 inches; angle braces, 3x6 inches; foot braces, 2x6 inches; bottom planks, 2x14 inches; side planks, 1½x12 inches; all planks, 16 feet long.

The work of clearing, grading, as well as the construction, was done under the supervision of the engineer of the company, A. M. Reynolds.

Dam to old dam site, 6080 feet, cost per foot, $2.76½; total cost	$16,814 34
High trestle to grade, 1411 feet, cost per foot, $3 65⅝; total cost	5,159 88
Grade to tunnel, 2971 feet, cost per foot, $2.22½; total cost	6,617 26
Total cost	$28,591 48
Average cost 10,462 feet of flume	$2 73⅜ per foot
Lumber used in construction	994,024 feet

Fearing a rise in the river (the construction being made late in the season) it was not deemed wise to handle the lumber by floating it down the river, hence the flume was built from the lower end. The delay in the delivery of the lumber by the sawmills and railroad caused postponement of work at different times and made a consequent increase of cost per foot.

Both constructions, the dam and the flume, are substantial and efficient for the purposes designed. The construction costs are notably low considering the magnitude of the works and the physical difficulties that had to be overcome. For the excellence and economy of the work, the engineers, L. F. Warner, Jr., and A. M. Reynolds, are entitled to full credit.

The Betty Cyanide Process.

The precipitation of the gold from cyanide solutions is effected by zinc or by electrolysis. Both methods are efficacious, but with ores as pure as those of the Witwatersrand the precipitation by zinc is considered the better for concentrates and sands. For very weak solutions from the treatment of slimes it would have been inapplicable if Mr. Betty had not devised a simplification of it.

The Betty process enables the gold to be precipitated from extremely dilute solutions. It is consequently specially adapted for the treatment of slimes. The principle is as follows: The zinc cuttings are immersed in a solution of acetate of lead, and are thus covered with a coating of lead. They are placed in the precipitating vats and the solution is passed through. A current of fresh solution of cyanide is added during the process. The zinc and lead form an element of a galvanic pile, and the gold is precipitated on the lead that covers the zinc.

In preparing the zinc, the fine cuttings are placed in a solution of acetate of lead (10%). The zinc is moved about continuously, and care is taken to obtain a lead coating on both sides. When thus prepared it is immediately placed in the precipitation tank, which is filled with the auriferous solution, so as to obviate contact with the air. The second important point is the addition of the cyanide solution at the top of the tank. A 2½% solution is prepared by dissolving twenty pounds of cyanide in seventy-five gallons of water. This solution is allowed to run freely into the tank with auriferous solution for about four hours, thus bringing the strength of the solution to be precipitated from 0.007% to 0.025%. When these twenty pounds of cyanide have been used, a second solution is prepared in the same way with ten pounds of cyanide, and it is allowed to run into the tank for six hours. It brings the strength to 0.007%. After twelve to fourteen hours a small piece of cyanide is allowed to fall into the auriferous solution, and the strength is brought up to 0.007% to 0.008%, and this is continued throughout the precipitation. With a precipitating tank 25 feet long, 6 feet wide and 5 feet deep, and divided into five compartments, fourteen to fifteen tons of solution may be treated hourly. By degrees the zinc loses its precipitating properties. After ten days the zinc in the first compartments must be replaced. Instead of using the zinc from the last compartments for the purpose, it is more advantageous to put in freshly prepared zinc and to use the inert zinc in the precipitation of solutions stronger in cyanide derived from the treatment of the sands.

The advantages of the Betty process over the Siemens & Halske process are: (a) more complete and quicker precipitation, (b) diminution of the cost of installation, (c) suppression of electric plant, (d) diminution of the volume of the precipitating tank, (e) economy in the cost of working, and (f) no royalty. On the other hand the drawbacks are (a) the necessity of transporting the zinc from one tank to another, and the consequent lack of accurate check on the operations, (h) the frequent cleaning of the tanks, and (c) it is not proved that a better yield is obtained. The cost of treating 10,300 tons of slimes by the Siemens & Halske process is said to be as follows: Potassium cyanide, $0.133 per ton; lead, less litharge, $0.0665 per ton; motive power, $0.019 per ton; royalty, $0.0285 per ton; total, $0.247 per ton. The cost of treating 11,300 tons of slimes by the Betty process is: Potassium cyanide, $0.0855 per ton; zinc, $0.057 per ton; sulphuric acid, $0 038 per ton; motive power, $0.0085 per ton; acetate of lead, $0.0085 per ton; total, $0.1985 per ton. These prices do not take into account the labor, lime, general costs and depreciation, which are the same in both cases, about $0.475 per ton. The two results are not strictly comparable. It is impossihle, therefore, to assign distinct superiority to either of the two methods.

Method in Thinking Out Engineering Problems.

Written for the MINING AND SCIENTIFIC PRESS by C. H. FITCH.

There is no use in reflections upon the nature of a manager's mind unless there can come out of them some systematic method of enabling the confused, incapable mind, groping about in its dark room, to find the knob of the door and come out into capability. Existing methods have but one word in solution of this problem, and that is environment. A man is surrounded by the methods and utilities with which he has to deal, and gradually observation takes hold; there is much imitation, and a little reasoning from cause to effect, and the practical man is produced.

Sometimes this product can hardly be called a finished one, and with any change of situation the subject is again confused, seeing "men as trees walking," and only gradually getting the scale and color of the new surroundings.

I cannot see but that much of this procedure is inevitable. We must have a stock of images and relations as the sub-structure and foundation of the edifice. It does not, however, follow that the architect should go on duplicating mudsills to the height of domes and pinnacles. Having got a start, and images enough to bank upon, we should no longer be satisfied with reliance on the accidental throwing together of ideas, hoping that they will be overruled for good arrangement, but should proceed in a course of rational design.

In all modern scientific advances the method of comparison is a stronghold. It began in the science of language. P. T. Barnum was wont to quote scripture out of compliment to his wife, Charity—"without Charity I am nothing." The study of philology in like manner amounted to nothing until it became comparative philology. To say nothing of comparative anatomy and comparative religion, we have recently had several papers on comparative dimensions of engine parts, exposing great variations, and serving to correct the practice of engine design.

The method of science is essentially comparison. Invention, which goes a step beyond science in fitting its discoveries for usefulness, ordinarily does this by using the method of substitution in addition to comparison.

Invention has been described as a habit like punning upon words, which habit grows with practice. Some men, like Crosby, Richards and Edison, have great numbers of patents to their credit, showing the habitual exercise of the inventive faculty until it becomes second nature, while, on the other hand, great numbers of people invent nothing.

Such facts argue a method, and the method is comparison with substitution. This substitution results in new combinations, and a combination patent is an expression which covers many results of this method of substitution. The use of certain familiar reagents in chemistry is a like method of "trying it on," by means of which new properties and relations of matter are revealed.

Invention is a regular part of the mental equipment of a mechanical designer. "Pring me anydings, an I invends it for you," said a German, meaning that he would elaborate designs in pursuance of any suggestion. Invention is expected in the American manager. The question is frequently asked in employing a new mechanical foreman, "What improvements has he made to secure better economy of working?"

But a man may say, "It is not in me to invent." No man knows what is in him. We may go on one of two notions, either that inventive ideas strike a man like unbidden lightnings (unbidden as lightnings are supposed to be, although, in fact, every thunderbolt comes in answer to a call), or that he may draw them to him by processes of thought within his own control. Taking the latter view to be the correct one, a person of the contrary part might say that it was "up" to me to produce the processes.

As an example of working out engineering conclusions by a process of comparison and substitution, let us take a chain of phenomena accompanying construction, such as this:

A lightning rod is extended from the damp ground up above a building that it may collect the electric discharge from the clouds upon a conductor, and so prevent the damage which would come from the discharge of the bolt through the poorly conducting materials of the building.

Apart from this series, let us then take an isolated fact on the treatment of which we wish to throw some light—the electrolysis of water pipes.

Josh Billings called the caterpillar a slow bug, and much of the entertainment of humor lies in far-fetched analogies. Electrolysis is a very slow thunderbolt, but both are forms of electrical discharge, of combustion, of energy. The air is comparatively non-conducting, but the electric current bolts through it. The earth is a better conductor, but not good enough to carry the current, so it goes to the iron pipe as the premium goes to preferred stock.

The lightning rod is a path set for the current to travel in. The iron pipe is a path on which it trespasses. The depressed head of the common street car rail makes convenient, smooth running for ordinary vehicles, but street car companies, wishing to discourage such wear of their tracks, struggle to put in the tee or rounded head rail, which does not afford a nice pair of grooves for teamsters' wheels. If tramway companies, animated by this motive of exclusion, substitute tee for grooved rails, water companies may substitute coated or composition pipe which will discourage electrical flow.

The iron pipe is, however, cheaper and is already laid in thousands of miles of streets. Turning from the idea of impairing it as a road for electricity, we have the alternative of providing a preferred route for electricity as the rod leads the bolt quietly away. The rod leads to something, namely, the ground. The conductor that we may devise to prevent the current from going to the pipe must be already in the ground and must lead to a better—and this, again, to a still better—conductor; but what finally? A Roman general was asked his ambition. "To conquer Italy." "And after that?" "To conquer Africa." "And after that?" "To conquer the world?" "And after that?" The idea of conquest being at the end of its string, he was obliged to fashion a new idea, so he said: "To take my ease, and be merry." In like manner we must reach another idea than that of an electrical current flowing in one direction.

This idea is that the current which we had thought of as single is really dual. The conductor is not merely an avenue from one thing to another in one direction. There is in it an element of mutuality. The electric charge in the clouds does not, with eagle vision, select the copper rod and strike. The charge reaching up from the earth into the copper rod is doing its part in an attracting power as real as that of the bolt, equal to that of the bolt, and silently exerted through the air before the resistance is overcome. We think of the bolt going to earth, its destination as a traveler, a one-sided force. Trying to use this idea in prevention of electrolytic action on pipes in the ground, we are obliged to use a better conductor than the ground to a different destination than the ground.

We lift a weight from earth, and it falls to earth. The fact that the earth falls to the weight is too small to be easily perceived, and it is only discovered in science by the partial parallels of analogies drawn from other phenomena. Finding no absolute destination in the case of electrical action in the ground, we are driven to see that it is dual. Important inventions often hinge upon the perception of a simple fact of this kind. Agassiz put a student to the test of describing a crustacean. The young man reported again and again all the things that he could notice about it, but the scientist would not be satisfied until he put down on his paper that right and left sides were alike, that it was a dual creature. This was a thing that anyone might see, but few would definitely notice and use to a purpose.

The hundred-ton concentrating mill composed of two fifty-ton mills, side by side, so that one can be repaired while the other continues at work, is like a man with two organs of each kind most exposed to injury. I have an amiable friend who has just repulsed an all but fatal attack of pneumonia. One lung was solid and useless. But for having the alternative of another, his mill would have shut down for this world. But the surgeons stimulated the operating lung with oxygenized air, cut their way to the closed lung, removing a section of rib to reach it, and drained it of dead matter, making it active again.

One crusher often serves both sides of a double mill. One set of organs that are less liable to be put out of work serve a man.

The electrical action in the ground is like drawing apart two weights pressed together by a spring. On release they again come together, and if one is comparatively small its travel is great, and it has a transit like the passage of a current.

Electrolysis of a pipe is one of the most troublesome problems before engineers for solution. The destruction of city water pipes is a serious calamity. The lightning's bolt strikes a tree and splinters it

with one blow. The electrolytical action is like a series of imperceptible blows, whose effect is only noticed in the aggregate, like the incessant small raps of a pene hammer, by which hard metals are "pened" are swaged and caused to flow.

We are, then, led to ask what draws these forces apart that they should be in position to strike together so usefully, and also at times so dangerously. It is a power applied as in pumping, as in the heaping up and apart of water that it may come down and together again. The sun is "drawing water" continually, little by little, but it is no small thing which comes down in the cloudburst.

Only within a few years past have men learned the trick of parting the elemental forces whose effort of reunion is electrical power. The discovery of new static elements goes on apace, mostly so designated because they make lines in the spectrum. Many of them have not been developed as of industrial significance, and we might question whether a new line in the spectrum was good reason for giving a substance the name and dignity of an element. The spectra of elements are still complex. But the spectrum will bear watching. It enables us to say this is, and this is not. To it all static elements come to test, and in it we may find new general laws for all elements, and with them new powers and utilities. But exactly what are these cracks in the spectrum, these natural slotted screens with darkness or luminous color back of them, and is it not likely that they will disturb the very democratic idea that each element is a positive "it," or definite unit, with one vote in the universe? I have several ideas coming on this subject, but when I speak of electrical elements I mean something of a different kind, live ones, those that are in the province of the maker of power.

The direct current was first utilized by the trick of commutating alternations at one point. This arrangement was, no douht, due to an imperfect understanding of the nature of the electrical current. A device—the commutator—was invented to get rid of the alternations, rather than to use them. All through the industrial arts we have arrangements for throwing away things with uses. The compositor may throw out "the durned horned e" that he does not understand. The early Leadville miner, looking for something else, threw out the ore which he called "heavy porphyry," until some one took the trouble to analyze it. The early electrical idea was to get rid of alternations. Later came the understanding and application of the alternating current, which not only excels the direct in its field of usefulness, but is a better general expression of electrical action.

So, mentally considered, we make our way from the conception of Franklin with his kite string drawing sparks from the clouds to the conception of our modern electricians working with the alternating system—for example, Tesla and Ganz, the latter giving name to a system which threatens to supplant the direct current systems still employed in most tramways for urban and interurhan transportation.

But some one may say: It is easy to go over what other men have already thought out. Go farther. If you have found any device of mechanism in thought, push this thinking machine into the future, as a miner pushes a coal-cutting machine into a vein, and cut out what it holds for us.

Recent expressions of Tesla have been thought speculative, vapory and impracticahle. They have not heen popularly understood. Understanding moves slowly in the invasion of new fields. It is conceivahle that we can hy exercise of power—not without it—so separate the elemental forces in nature anywhere that power will he made available for use without going to waterfalls after it. This clue we have from finding electrical action to he a parting of elements by power. This, to be sure, is only stating the proposition. It is not finding a solution, hut it indicates where we ought to look for it.

And where are we to look for a solution of the problem of the electrolysis of water pipes? Simply to this fact, that our separated elements whose reunion is power must be effectively harnessed as yokefellows. They must he kept apart, as the elements of rackarock are kept apart, till they are ready for use. They must not he allowed to leak through earth as straggling corrosive powers. It is like all large questions touching human affairs, an ethical as well as an engineering question.

In early periods land was held in common, especially pasture land. Agriculture and individual ownership brought in fences. Now, in the development of electricity, new boundaries of neighborhood rights and privileges must he planned. The conductor, to safeguard the rights of others in the new-found world of electrical power, must be double—direct and return. That is where we come out as a conclusion on electrolysis. The expense of complete guarded return current lines must he provided. But what is good for neighborly interests is also best in electrical engineering. In Chicago there has been much trouble hecause the electric roads lack power to do their work. Mr. Ellicott, the electrician of that city, charges this inefficiency to the defective return circuits through rails with defective honds, causing a waste of one-third the power. The power which works mischief is lost for good.

This train of thinking is hut an illustration of processes of comparison and substitution. The strength of the practical man lies in the fact that he has at least one complete system with all the details of which he is familiar. Give him hut one fact in another field or place, and he commences to draw parallels from it and construct a system similar to that of his experience. When he finds the parallel will not work, he is mistaken and learns something. Criticism introduces him to new arrangements. "Every knock is a hoost" toward that facility in meeting requirements with suitahle plans which should distinguish the engineer. And his proficiency comes from keeping "everlastingly at it" with the comparative method.

The Treatment of Clay Slimes by the Cyanide Process and Agitation.*

NUMBER IV.

By E. A. H. TAYS and F. A. SCHIERTZ.

DISCHARGE.—When first arranged, a 6-inch flange was holted to the side of the agitator, so as to hring the hole on a level with the hottom. Into this flange was placed a nipple, on which was put an elhow just tight enough to turn with ease; and into this elbow was set, at an incline of ahout 20°, a 3-foot length of 6-inch pipe, which discharged into a large V-shaped launder, running hetween the tanks, under the floor. This launder carried away the pulp.

Into the end of the discharge pipe a big plug was driven, over the end of which a stirrup would drop, to hold it in place. This plug was secured hy a chain to the floor, to prevent its heing carried away hy the charge, when knocked out. We soon found that the 6-inch discharge was hard to control while discharging; so a plate with a 4-inch hole in it was holted over the opening, inside the tank. This gave perfect satisfaction; and ten tons of slimes could be run out inside of thirty minutes.

As soon as a tank was discharged, water was run in and the tank washed out. Ahout one hour was required from the time of starting to run in the water until the tank was ready for the next charge. The whole operation of treating a charge of ten tons of slimes occupied ahout twenty-three hours. The six agitators would he charged by noon every day, and on the following day each would he discharged and cleaned, ready for a new charge, ahout one hour before the time for charging it.

TAILS SAMPLES.—About 2 feet from the end of the discharge launder was a 1.5-inch hole through the side, tapping the hottom. Five minutes after a discharge hegan, two tails samples (one liter each) were taken at this hole: one to he washed and dried, to show total extraction; the other to be evaporated, to show actual recovery and soluhle gold.

When we were experimenting we made many tests on taking tails samples, sampling one charge every five minutes from the start to finish of discharging. These samples were so nearly uniform in value that it was seen that any one of them would have given practically the same results.

We also found that samples taken from the surface of the charge, while in agitation, checked well with samples taken from the discharge launder. The agitator was always kept going until the charge was out and the tank washed.

SETTLING BOX. — In decanting we could draw off 80% of the settled solution perfectly clear; hut with the remainder, small thread-like streams of slimes would he carried over also; and these, though seemingly insignificant when mixed with all the solution, sent a somewhat turhid solution to the zinc hoxes, notwithstanding the considerahle settling which took place in the storage tanks. To obviate this difficulty we put in a large settling hox, which helped matters materially. (The form and dimensions of this hox were shown in the illustration which appeared in the last issue.) The solution, after decanting, as already described, was pumped up from the receiving tanks to the settling hox at the rate of ahout 125 gallons per minute. The discharge end of this box was 8 feet across, and the surface current was nothing to speak of, up to within the last foot of the discharge; so that although the solution, run into the storage tank, still carried some slimes in suspension, the quantity was so small that a heakerful, settling over night, would show harely a trace on the hottom.

After we had put in the settling hox, we used to draw off the clear solution as close as possihle, even if more or less fine slimes did come off at the end. The whole secret of settling is: to make sure, first, that all suspended matter shall he thrown toward the hottom; and, second, that the flow over the edge of discharge shall he so thin as to reduce the current to a minimum.

We found that 125 gallons per minute was a little too much for even the 8-foot discharge to handle, as the overflow was nearly 0.125 inch deep. An overflow 2.5 feet wide was then cut on each side, at the same level as the end overflow, as shown at g, g, in Fig. 3, a little hack of the center of the hox. This gave very good results, and, with the aid of other arrangements in the storage tanks, sent the solution to the zinc boxes with very little suspended matter.

Before the side overflows were put in, the surface current was measured, and found to amount to 125 gallons per minute, with a velocity of 10 feet in 6 minutes from the head of the box; the next 15 feet in 8, and the next 20 feet in 9.5 minutes. After the side overflows were put in, the rate and direction of surface currents were established as shown in Fig. 4.

The float for testing the currents in the settling hox was half a match, a new piece heing taken at every trial.

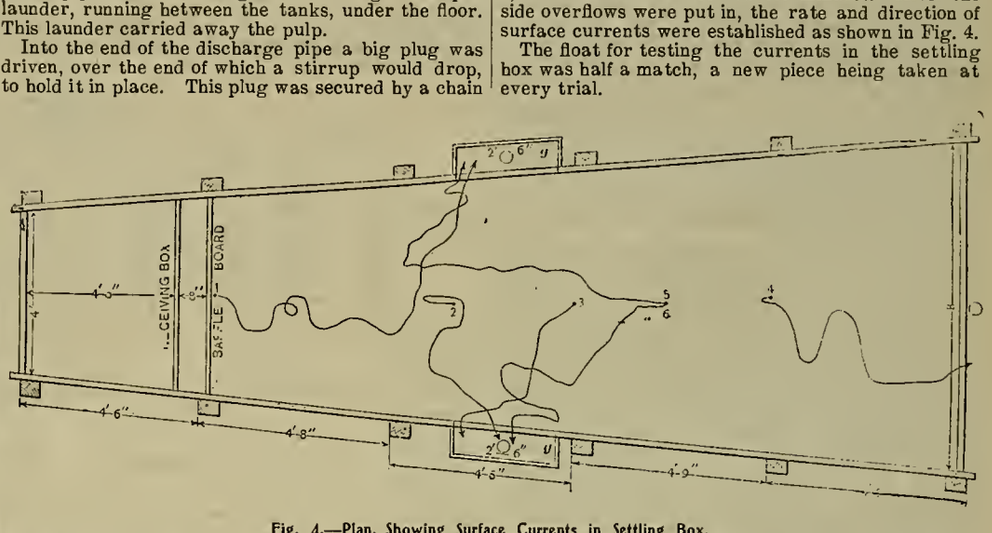


Fig. 4.—Plan, Showing Surface Currents in Settling Box.

No. 1, after many delays and changes in direction, went over the left-hand side overflow in 15.33 minutes. Nearly two-thirds of the time was taken in covering the first third of the distance.

No. 2, after starting for the haffle-hoard, turned hack and, running around the starting point, headed for the right-hand side overflow, going over in 8.25 minutes from the start.

No. 3 started at once for the right-hand side overflow, and went over in 3.25 minutes.

No. 4. started hack towards the head, was stationary a short time, then turned and made its way, zigzag, to the end overflow, going over in six minutes from the start. There was a notable increase in speed within the last 4 inches.

No. 5 started straight up towards the haffle-hoard, hut within 2 feet from the start was caught by a slight draft and carried very rapidly ahout 2 feet farther in the same direction; it then continued in the same course up to the first set of hraces from the baffle-hoard. Here it turned, taking the same general direction as No. 1, and went over the left side overflow in six minutes from start.

No. 6 was a repetition of No. 5. It started straight up towards the haffle-hoard for a little over a foot; there it wavered a moment, and then headed direct for the right-hand side overflow. When two-thirds of the distance had heen run, it started up towards the head and center. When opposite the center of the right-hand side overflow, it headed for this, but gradually swung down stream until opposite the lower end of the side overflow, when it turned hack, and when opposite the center turned and went over, in 5.33 minutes from the start.

The hox was cleaned out every fifteen days, and the accumulated silt on the hottom was found to he rather compact, although soft, after the supernatant solution had been decanted. The accumulated slimes would amount to ahout 1.5 tons; and as 200 tons of solution, more or less, were run through daily, this would make the amount of slimes held in suspension equal to ahout one pound to the ton. By using this hox we were enahled to draw off the settled solution in the agitators much closer than we could otherwise do, and yet send the solution to the zinc hoxes carrying less suspended matter than hefore.

The box had a 4-inch discharge, for washing it out, in the center of the hottom, immediately in front of the haffle-hoard, and a decanting apparatus on one side, within 5 feet of the discharge end. A 2-inch water pipe, entering it over the side, near the haffle-hoard, furnished water under pressure to wash it thoroughly, after the slimes had heen shoveled out.

(TO BE CONTINUED.)

* Trans. American Institute Mining Engineers, Mexican meeting, November, 1901.

The Use of Petroleum for Power Purposes.

Written for the MINING AND SCIENTIFIC PRESS by W. FORSTNER, E. M.

The discovery of extensive deposits of petroleum on the Pacific coast gives actuality to every investigation tending to its increased use. Petroleum has already to a certain extent replaced coal and wood as fuel under the steam boiler, and is used for the purpose of directly creating power in petroleum engines of all kinds.

The following has heen written to call attention to the use of oil for power purposes in the form of gas in gas engines. The manufacture of oil gas from crude oil and its fractions and its use as motive power in gas engines have been made in Europe, and from the results ohtained there conclusions can he drawn as to the advisahility of their use here.

The first question is: What product can he expected from California oils?

The value of any gaseous suhstance to he used in an engine of internal comhustion, to which type the gas engine belongs, as well as do the gasoline and petroleum engines, depends upon its combustihility and calorific value. There are very little exact data ahout the calorific value of petroleum fractions in general, and of those of California petroleum in special. The chemical composition of the different products of distillation is very seldom given. Generally the chemical data at hand only give the elementary analysis of the petroleum—that is, its content of carhon, hydrogen and oxygen, sometimes nitrogen and sulphur; while petroleum is in fact a mixture of various hydrocarhons.

The calorific value of petroleum can not he calculated from these elementary analyses, as is the case with solid fuel. Prof. Rankine has called attention to the fact that the calorific value of carbon in gaseous form must he higher than the 8080 calories due to that element in solid form. Aydon remarks on this subject in regard to petroleum: "There is a fuel hy nature prepared to the first stage towards gassification. To effect the same result artificially, 3300 calories or more would have to be expended. This heat would become latent and he lost as useful work. Adding these 3300 calories to the 8080 calories derived in converting solid carhon into carhon dioxide, would give the 11,400 calories which Prof. Rankine stated to he the amount due to gaseous carhon."

Applying this to petroleum of the composition: carhon 86.48, hydrogen 7.06, we find:

For solid carhon, calorific value 9390 calories, evaporative power 17.50 pounds of water; and for gaseous carhon, calorific value 12,327 calories, evaporative power 23.00 pounds of water.

On the other hand, carhon does not occur in petroleum in the solid nor in the gaseous state, but in a transitory state hetween the two; hence, its actual heat of combustion lies prohahly hetween the two values ahove given.

Besides, the carbon occurs in petroleum combined with hydrogen into various hydrocarhons, which are readily dissociated by the action of heat, forming other more gaseous hydrocarhons, especially in presence of water vapor, until finally, in case of complete comhustion, the carbon and hydrogen present are all comhined with oxygen. These chemical rearrangements must influence the calorific value of the final result, which can therefore only he determined by experiments on large scale, not hy calculation.

The calorific value of the mixture comsumed in engines of internal comhustion, he it gas and atmospheric air, as in gas engines, or vapors of the lighter hydrocarbons and air, as in petroleum engines of all kinds, is further complicated hy the fact that this comhustion takes place in the presence of a preponderating amount of inert gas, the nitrogen of the atmosphere, which retards the velocity of the gas molecules acting on each other, while hesides interfering with their close contact, in hoth ways decreasing the rapidity and the completeness of the comhustion. It is only reasonahle to suppose that this retarding effect of the inert gas varies with the different hydrocarhons, probably in some ratio to the velocity of motion of their respective molecules.

As the final pressure and temperature of the gas mixture, after combustion in the cylinder, depend upon the rapidity of the comhustion and its completeness, and as these final pressure and temperature control the efficiency of the gas mixture, it is clear that to exactly calculate the theoretical efficiency of the mixture hurned in internal comhustion engines requires data which are not available; hence, we must be satisfied with approximate values.

The manufacture of gas from mineral oils is a well estahlished process. Oil gas has been more specially used for illuminating purposes; still, especially in Germany, a great number of apparatus have been producing fuel gas, of a calorific value at least twice as high as that of coal gas for equal volumes. The relation between illuminating gas and fuel gas distilled from coal is of value in this connection. Some chemists have proposed to interrupt the coal distillation and to separately collect the gas resulting from the first period for use as illuminating gas, and that from the later period of distillation as fuel gas, claiming the latter to be of higher calorific value. This proposition, however, loses sight of the fact that, per volume, hydrogen is a much poorer gas than most of the hydrocarhons, and that a gas wherein the volumetric percentage of hydrogen augments at the cost of the hydrocarhons will lose in calorific value. Mr. Hunt has condensed the results of a very thorough study of this matter in the following tahle, showing that the illuminating value and the power value of a gas are much more closely allied than is generally supposed, and that there is reason to use for the production of power a gas with high illuminative power, the reason heing that the hydrocarhons which contrihute the most to the intensity of the light are at the same time the most important calorific factors:

TABLE I.

Illuminating Power in Candle Power.	Consumption in Cubic Feet Per I. H. P. Hour.	Illuminating Value.	Power Value.
11.96	30.31	1.000	1.000
17.20	22.70	1.435	1.338
26.00	16.26	2.173	1.864
29.14	15.00	2.436	2.020

The following tahle, giving the composition and calorific value of various gases, will further emphasize this contention:

TABLE II.

Composition.	Coal Gas—Volume percentage at 10° C., 760 mm.	Coal Gas—Calorific value per 1 cubic foot of gas in calories.	Oil Gas—Volume percentage at 10° C., 760 mm.	Oil Gas—Calorific value per 1 cubic foot of gas in calories.	Oil Gas Gassified in Presence of Steam.—Volume percentage at 10° C., 760 mm.	Oil Gas Gassified in Presence of Steam.—Calorific value per 1 cubic foot of gas in calories.
Hydrogen, H	52.76	101.16	9.90	18.92	31.61	60.40
Marsh gas, CH_4	32.35	189.04	47.00	274 65	46.17	269.80
Illuminating hydrocarbons	5.49	65.26	37.70	351.38	16.29	151.80
Carbon monoxide, CO.	5.65	10.74	4.00	7.60	0.14	0.27
Carbon dioxide, CO_2	....	....	1.60	....	....	....
Oxygen, O	....	....	....	....	0.73	....
Nitrogen, N	3.76	....	....	....	5.06	....
Total calories		366.20		652.55		482.27

To ohtain a comhustible gas of high calorific power, however, it must not he scruhhed and purified; a poorly purified illuminating gas will be richer than a perfectly purified gas. The mechanical scruhhing of the gas eliminates the ammoniacal products, among which are the carhonates, chlorides, sulphides and cyanides, hesides free ammonia and sulphur, while the chemical purifying eliminates more especially the sulphuretted hydrogen and the sulphohydrate of ammonia, most of which products are combustibles.

Mr. Wirtz made various tests on coal gas with the following results:

	Calories.
Gas coming from the collector	321.25
" " " " condenser	317.15
" " " " scrubber	315.84
Gas entirely purified	303.25

Representing a loss of over 5%.

Practical experience has proven that the heavy hydrocarhons—petroleum fractions of 0.840 to 0.870 specific gravity—give the hest results as regards the yield and the power of the gas.

Lighter oils give a larger quantity of gas and decompose more rapidly; but when crude petroleum, containing much benzine and illuminating oils, is hrought into the retorts, where a temperature of 920° to 1000° C. is maintained, these lighter petroleum fractions are decomposed under regular carhonization, while the heavier oils are properly distilled at those temperatures.

If crude oils have to he used for the production of oil gas, it is preferable to use those not suitahle for illuminating oils; hut with the use of crude oils a heavy residue of graphite must he expected in the retorts.

In Europe the "intermediate oils"—which are those hetween illuminating and lubricating oils, with a specific gravity of 0.840 to 0.860, and a flashing point of 105° C.—are generally used for the production of oil gas. The black and thick residues of the distillation of petroleum have also heen used with remarkahle success.

These "intermediate oils" are more or less equivalent to what are in California called "distillates," which form 16% to 30% of the crude oils. Owing, however, to the latitude used in commercial terms, and the great variety in the different California oils, it is difficult to determine precisely what product is really designated hy the term "distillate." Some cut off the distillation for illuminating oils at 250° C. and for luhricating oils at 350° C; the distillate at 300° C. varying in specific gravity from 0.880 to 0.875; in other petroleums the same is done for illuminating oils at 200° C. and luhricating oils at 300° C., and the distillate at 250° C. varies from 0.844 to 0.810 specific gravity. Again, others give the specific gravity of distillate still lower, at 0.790 to 0.810.

The choice of the oil to he gassified is mainly a question of the price of the suhstance, as the use of crude oils, especially those which carry only a slight percentage of the lighter hydrocarhons, is not sufficiently ohjectionahle to justify the use of a more adequate petroleum fraction, when there is a pronounced difference in price hetween the two.

The various processes for the manufacture of oil gas are all hased on the same principle—a gassification of the oil hy heat, in cast iron retorts, generally lined with refractory material, with or without the presence of steam, the heat in the retorts heing from 920° to 1000° C. The tar vapors are suhsequently precipitated in hydraulic condensers. The capacity of the retorts is from 500 to 800 cuhic feet per hour. The quality of the gas and the numher of cuhic feet ohtained per gallon of oil depend upon the temperature of the retort and upon the rate at which the oil is allowed to enter into it. In fact, every oil requires special treatment to insure the most satisfactory yield and hest gas.

Mr. J. Taylor patented in 1815 an apparatus consisting of two cast iron pipes or retorts, heated in a fireplace, to manufacture gas from mineral oils. A great numher of processes have heen proposed and actually used since, but it would exceed the scope of this article to mention all of them. I shall briefly mention two, representing the two methods, gassification without and in presence of steam.

The Mansfield oil-gas apparatus has heen used extensively. The oil runs in a thin stream through a pipe into the upper part of a vertical cast iron retort lined with fireclay molded blocks. It is vaporized in the pipe, and the oil vapor, passing down into the interior of the retort and coming in contact with its red-hot walls, is decomposed and converted into a permanent gas, which now passes through a standpipe into the hydraulic hox, where the tarry and other condensable products are separated; from there the gas is conducted into the gas holder.

This apparatus makes 1000 cubic feet of gas from 7 to 9½ gallons of intermediate oil. [See later about this production.] Messrs. Crossley Bros. found that in their 12 H. P. nominal Otto engine the consumption of this gas was 10 cubic feet per brake H. P. hour, representing a fuel consumption of 0.07 to 0.095 gallon of oil per brake H. P. hour.

Comparing this with the consumption of oil as fuel under the steam hoiler, we find that in the tests made at the Western Sugar Refinery 0.34 gallon of oil was required per hoiler H. P. hour, representing at least 0.5 gallon per hrake H. P. hour, or nearly seven times as much.

In the Roger's and similar processes the gassification of the oil takes place in the presence of steam. The steam is decomposed and whatever carbon hecomes free during the relations between the various hydrocarhons and the nascent of the steam, combines with the oxygen, forming carhon monoxide, thereby preventing the deposit of solid carbon. The percentage of illuminating hydrocarhons is less in this gas than in ordinary oil gas and its calorific value is smaller; but the reduction resulting from the presence of steam during the gassification is much less than in the case of coal gas.

The following table clearly indicates the different results of the introduction of steam in the gassification process of solid and liquid fuel:

TABLE III.

Constituents in Volumetric Percentage.	Coal Gas.	Producer Gas.	Oil Gas.	Roger's Gas.
Hydrogen	52.75	18.73	9.90	31.61
Illuminating hydrocarbons	5.49	0.31	37.70	16.29
Marsh gas	32.35	0.31	47.00	46.17
Carbon monoxide	5.65	25.07	4.00	0.14
Carbon dioxide	....	6.57	1.60	....
Oxygen	....	0.03	....	0.73
Nitrogen	3.76	48.98	....	5.06
Calorific value in calories per cubic foot	366.20	89.89	652.55	482.27

We see that in the case of producer gas the steam changes the final product from a hydrocarhon gas into a gas wherein carbon monoxide forms the prominent comhustihle; while in the case of oil gas the main difference consists in the decrease of illuminating hydrocarhons and consequent increase of uncombined hydrogen. This difference in the effect of the presence of steam is clearly the result of the different state wherein carhon occurs in the two fuels, which has heen discussed ahove.

In regard to the yield of gas per gallon of oil, it must be noted that when gassifying for illuminating purposes without steam, one gallon yields 90 cubic feet of gas, and when in the presence of steam from 120 to 150 cuhic feet. In both cases a liquid residue, amounting to ahout six gallons per 1000 cuhic feet of gas produced, is left, quite suitable for the manufacture of fuel gas; hence, the yield of this gas can be placed at ahout 140 cubic feet and 250 to 300 cubic

feet, respectively. This amount of 140 cubic feet per gallon is equivalent to seven gallons per 1000 cubic feet, the higher production figure given above for the Mansfield oil-gas apparatus.

These figures indicate another similarity in the relative behavior of coal and producer gas and oil and Roger's gas, respectively. (I use the term Roger's gas here to designate the product of gasification of oil in presence of steam.)

To produce 1000 cubic feet of coal gas requires 222 pounds of anthracite.

To produce 1000 cubic feet of Dowson producer gas requires 13 pounds of anthracite.

4.5 to 5 pounds of anthracite are required per brake H. P. hour, using coal gas.

1.3 pounds of anthracite are required per brake H. P. hour, using Dowson producer gas.

To produce 1000 cubic feet of oil gas requires 7 gallons of oil.

To produce 1000 cubic feet of Roger's gas requires 3½ to 4 gallons of oil.

These figures confirm that the actuating influence of the steam is less in the gassification of liquid fuel than in the case of solid fuel, probably because in the former the carbon is already in an incipient state towards gassification, hence less requires an activating agent. The necessity of admitting air while manufacturing producer gas has also naturally a great influence on the resultant product—a necessity which does not exist when gassifying oil in the presence of steam.

As to the respective fuel consumption of gas engines and petroleum engines—in which term I include all engines using vapors of petroleum fractions—gas engines will not require over 0.07 gallon of oil per brake H. P. hour, while petroleum engines vary from 0.09 to .16 gallon per brake H. P. hour.

The gas plant for a gas combustion engine is entirely independent in its location from the engine plant; it can be erected at any convenient point and the gas piped to the various engine plants without any loss of power. The petroleum engines are small carburetors—that is, they all carburet atmospheric air with vapors derived from the petroleum fractions. Air is readily carburetted, but just as easily loses the hydrocarbons when submitted to friction or low temperature; hence, the carburization must take place in the closest vicinity of the cylinder wherein the product is to be used.

The gas plant gassifies all the oil fed to it, and can use any oil or product, excepting those containing a large amount of light hydrocarbons—preferably the oils which are less in demand for other industrial purposes and the safest to handle.

No excessive claims must, however, be made for engines of internal combustion in comparison with the steam engine. While it is perfectly true that the same amount of effective power can be developed in the gas engine with a much smaller amount of oil than if used as fuel under the steam boiler, yet the engines of internal combustion have other disadvantages which render them less available in practical use than the steam engine for many industrial purposes.

Electric and Compressed Air Mining Locomotives.

Written for the MINING AND SCIENTIFIC PRESS by FRANK C. PERKINS.

It may be of interest to consider the details of some of the leading types of mining locomotives, operated both by electricity and by compressed air, and compare their working advantages and disadvantages, as well as note the principal differences of construction and operation from the steam locomotives in modern practice.

There are various forms of electric locomotives as well as air locomotives constructed by manufacturers in this country and abroad. An electric mining locomotive constructed in Geneva, Switzerland, by the Cie de L'Industrie Electrique, is equipped with two electric motors, which operate upon a circuit of a potential of 500 volts, each motor having a capacity of 12 5 H. P. This locomotive operates upon a track of 60 centimeter gauge, and is one of five employed in the mines of the Societe Franco-Italienne des Houllares de Domhrowa in Pologne, Russia. A double-end Baldwin-Westinghouse electric mining locomotive, designed and constructed at the shops of the Westinghouse Electric & Manufacturing Co. and the Baldwin Locomotive Works, is worthy of note in this regard, as is a single-end electric mining locomotive constructed by the Jeffrey Manufacturing Co., this latter machine being supplied with three electric motors. It has a drawhar pull of 8000 pounds and its total weight is 20 tons. The speed of this outfit is from 6 to 10 miles per hour and the minimum gauge is 36 inches, while the width over all is 61½ inches. The length of this locomotive, excluding humpers, is 12 feet and 2 inches and its height is about 4 feet. The wheel hase is slightly over 5 feet and the diameter of the drivers is 28 inches, and the lightest steel rail recommended to be used with this machine is 50 pounds per yard.

A compressed air locomotive constructed in Pittsburg, Pa., is equipped with 10½x14-inch cylinders, triple tank, and 48-inch gauge. It is a six-driver locomotive and weighs 29,000 pounds. This type of compressed air locomotives is used for not only mining work, but freight service, logging railroads, steel works, and contractors' use in new plants under construction.

In the present state of the art power can not he transmitted to as long a distance hy compressed air as it can by electricity, the economy of electrical systems of power transmission being greater than that of compressed air systems as great distances increase. For local work for haulage in mines and switching locomotives in manufacturing plants, the compressed air locomotive is claimed to be as efficient as the electric locomotive, and in many ways has decided advantages over the electric locomotive, particularly when heated air is used in the motors is the efficiency materially increased.

It is asserted by engineers familiar with compressed air locomotive working that, compared with electric haulage, compressed air haulage is simpler, more reliable, and is not subject to breakdowns and interruptions, and that it is absolutely safe in gaseous mines, where electricity is as dangerous as steam. They also suggest that it is more flexible and convenient, inasmuch as the compressed air machine is complete in itself, able to reach all parts of the mine, wherever a track is laid, without requiring an overhead trolley line.

The electric storage battery mining locomotive is now being extensively used, and it is claimed for it that it has similar advantages over the trolley mining locomotive that the compressed air machine has. The item of maintenance and repairs is claimed to he greater for the storage battery locomotive than the compressed air outfits, and the latter are said to be far more economical than the steam or even the trolley electric haulage systems, as the tanks and connections are practically indestructible and the wear largely confined to valves, wheels and brasses. By heating the air it is said the increased efficiency is about 40%, as far as the economy of coal is concerned. An air locomotive when charged can travel with its load of several cars to the end of the run, and any stoppage of the air compressor does not tie up the system in any way, as would happen with the trolley system if the main generator were to be laid up for repairs.

In special, hazardous applications, where great care must be taken to avoid explosions or fire, the air locomotive is far better than the steam-driven outfit, as is also the electric-driven locomotive, the latter, of course, not being so safe as the former where gases are liable to be ignited. Air, being a perfect gas, is said not to have losses of condensation like steam, although there are losses, during expansion, from contraction due to fall in temperature.

The compressed air locomotive is constructed on about the same lines as if operated hy steam, so far as the machinery is concerned, the frame, valves, cylinders and mounting being very similar, the storage air tanks taking the place of the steam boiler. Very high pressures are used, as compared to steam locomotives, the most economical air pressures being not less than 700 pounds nor more than 900 pounds. The factor of safety of the tanks is quite large, the plates used having a tensile strength of about 60,000 pounds per square inch.

Before entering the working cylinders the air passes from the main tanks to an auxiliary cylinder or reservoir through an automatic reducing valve, which lowers the pressure to 130 pounds or 150 pounds, as desired. The constant working pressure of 140 pounds is maintained as long as the main tanks are charged with air above this pressure. The air passes from the auxiliary reservoir through a balanced valve to the valve chests. The auxiliary reservcir is usually constructed of wrought iron piping about 9 inches in diameter and 12 feet long, and serves to relieve such fluctuations in pressure as the operation of the engine may cause, aud provides a uniform working of the reducing valve mechanism. The usual locomotive Stevenson link motion controls the distribution of air in the cylinders, the air being used expansively.

The cost of operation has been found in several cases to be from 1 to 1½ cents per ton mile, including all expense, interest and depreciation of plant, varying with the character of the rolling stock used. The depreciation on the air locomotive is very low, there heing no boiler to wear out, and the tanks, having nothing to corrode them excessively, when well painted, wear almost indefinitely.

Compressed air haulage has much to recommend it, heing cheaper than rope haulage in many cases, and under many conditions is superior to electric locomotives, either operated by trolley or storage batteries.

Without a douht hoth the electric locomotive and the compressed air locomotive have each a field of their own, and there are many cases where one has advantages over the other. A great many mining electrical engineers dispute the claim of increased economy, flexihility and reliability for the compressed air locomotive over the electric method of propulsion, although it cannot he douhted that in cases where dangerous gases are to be found in mines the sparks from the trolley contacts are dangerous, and even with the storage battery mining locomotive the sparking at the commutator may produce as serious results from explosion as that of the trolley sparking.

Electricity is without douht a most convenient and economical form of motive power for mine haulage, and certainly in frequent cases has marked advantages over the compressed air system. As regarding compactness, the electric locomotive has slightly the advantage as to size for a given output, but the general operation of compressed air machinery in mines supplies a large amount of air available for ventilation, which is well worth consideration, especially if a large number of cutting tools, drills and motors are in continual operation.

The electric locomotive is perfectly adaptable to low and narrow entrles, and there are no moving parts exposed to external injuries, while the mechanism is of the simplest character. The running parts are readily accessible and the cost of maintenance exceedingly low. The electric system of propulsion will compare favorably with any existing system, particularly if other motors are used on the circuits for operating mining machines, pumps, ventilators, etc., and a common source of supply may he utilized for furnishing not only the necessary power for driving the machinery, hut for lighting the mine passages as well. Where the same generating plant can supply the necessary current for not only lighting with incandescent lamps, but working the hoisting and drilling apparatus, as well as the electric locomotives, the greatest economy is obtained. The electric system is far more efficient than the air pressure system, if the distance to which the power is to he transmitted is any great distance or the mining operations extend over a very large area, and a number of shafts are necessary, located considerable distances apart.

The electric mining locomotives are seldom called upon to operate at greater speeds than 6 to 10 miles per hour, and are usually designed to he able to develop their full load tractive effort at the former speed. The weight of train which a given electric or air locomotive will haul at standard speed on a straight track will vary according to the grade and the frictional resistance of the cars. The frictional resistance varies according to the condition of the track and the condition of the car and locomotive journals, ranging from 20 pounds per net ton weight to 80 pounds. Even the latter figure may be exceeded where the wheels of the cars are hadly worn out of true and scrape against the sides. The storage battery mining locomotives are designed hoth with the batteries mounted on top of the locomotive and also with the batteries mounted on a separate truck, the latter being used to transport material in mines where the vein is too thin to allow the locomotive to he used which has the battery upon the top of the frame. The battery locomotives have a full load running drawbar pull of 100 pounds, and on clean, dry tracks will develop even more, the rate of speed heing 8 miles per hour. The locomotives are usually supplied with trolley poles and connections as well, so as to he able to operate from the trolley line and have the batteries under charging current at the same time.

Electrical underground haulage systems are being rapidly introduced in mines in Europe and America, the electric locomotive having been found well adapted to this work where the grades are not too excessive, electrical hoisting and rope haulage systems being often adapted where the grades preclude the use of the locomotive. Steam, compressed air, rope—and even mule—haulage each has its special field, for which no other system is so well suited.

The steam locomotive has only the advantage of heing cheaper in first cost, while the depreciation and maintenance are high, and the bad effects of heat, smoke, gas, steam and sparks are very objectionahle, practically shutting out this class of locomotive for mine haulage.

The compressed air, rope and electric systems are most extensively used, the air heing well adapted to mines with gases, which are dangerous on account of explosions, and the rope system is preferable when the grades are excessive.

OWNERS of lands in the Joplin, Mo., lead and zinc district usually grant a first lease at 10% or 12½% upon tracts of from 20 to 80 acres. The lessees proceed, in most cases, with drills to prospect the land, which has been divided in tracts of 1 acre, known as a "lot." A sublease of four to six or eight lots is granted to another lessee, frequently upon the tracts upon which prospecting has been done, and this lessee proceeds to sink a shaft and open up the ground, usually paying from 15% to 20% royalty upon all mineral sold from his lease. Such improvements in hoisting and milling machinery as may he needed to properly handle the ore are made at the expense of the sub-lessee and remain his property. Leases hold for a term of years—usually ten—and, by their terms, operations must not be ahandoned for more than thirty days without the written consent of the first lessee or owner of the land, under penalty of forfeiture. As a result, a man possessed of a small grub stake in the past has been able by his diligence to develop excellent prospects. Resulting from this system, large acreage is developed at practically no cost to the owner of the land, and his royalties, paid weekly as sales are made, afford him a handsome income from productive ground. The system is the result of years of experience, and, while exceedingly simple, affords ample security to the fee owners, and at the same time gives to the mine operator all that is his due.

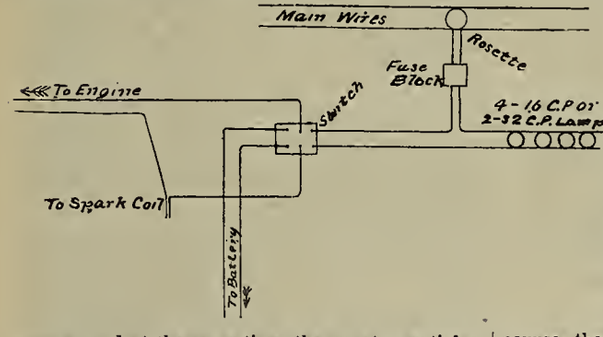
Gas and Gasoline Engine Ignition.

By Albert Stritmatter.

In the operation of a gas engine if there is any one thing which causes more trouble than another, it is probahly the igniter. All successful gas engines are now operated upon the principle of ignition of the explosive mixture under compression and at a certain point to give the greatest power possihle. An engine may he a perfect running machine with the exception of the igniting mechanism; hut, if this fails, the whole thing is as good as nothing. This is prohahly the most vital part of a gas or gasoline engine, for, if it is not effective, the engine is no better than so much scrap iron.

In considering this question let us first consider the different methods of ignition. There is one method which, while not a very satisfactory one, was put out on a very large numher of engines a good many years ago and there are a great many of the engines still in use. At the head of the engine was a sliding hlock of steel or iron. In it was a small hole ahout 1 or 1½ cubic inch in size. This slide would pass over a gas pipe and the small hole would he filled with gas and air. It then passed hack across the head of the engine, and in doing so the pocket passed a lighted gas jet or pilot light which ignited the gas in the pocket. As the slide moved on, the gas continued to hurn, and finally the pocket came to an opening which led into the cylinder. The device was so timed that this pocket of hurning gas reached the opening leading to the cylinder at the end of the compression stroke, thus causing ignition at that time. For various reasons this method of ignition proved unsatisfactory, although, as hefore stated, there are still a great many of the old engines employing this system still in use.

One of the methods of ignition commonly used at this time is that hy means of a hot tuhe. In this method a tube is placed on the engine and the explosive charge is compressed into it during the compression stroke of the piston. At the proper time the charge is ignited hy the heat of the tuhe, which is heated on the outside hy means of a gasoline hurner or gas jet. Several kinds of tuhes are used, the most



common, and at the same time the most unsatisfactory, heing the ordinary iron tuhe made of hlack pipe of ahout ⅜ inch or ½ inch diameter, and closed at one end. Porcelain is also used, hut prohahly the hest suhstance for the purpose is nickel steel.

The ohjection to this method of ignition is that it is affected by so many conditions which are not under the control of the operator and which vary from day to day, so that it is unreliahle. The iron tuhes oxidize and hecome scaled on the inside, delaying the ignition, and finally hurst through, necessitating a new tuhe. Although the tubes cost hut 3 or 4 cents a piece, the loss of time in putting in a new one is often considerahle. Where the engine is so located that there is a draught of air to play on the hurner which heats the tuhes, the flame is continually hlowing hack and forth and the tuhe is not kept at the same heat. This makes the hot tuhe very unsatisfactory for portahle use, and where there is any danger from fire it is also unsatisfactory. Atmospheric changes continually occur and affect the time of the ignition, so that it is constantly varying. As the maximum pressure produced is in proportion to the compression, it is essential that ignition take place at the point of greatest compression, and not after the piston has started to move forward, and thus reduce the compression. The exact point of ignition with a hot tuhe can he told only hy an indicator card, which few people are prepared to take even once in a while, let alone every day, and then make the tuhe to suit the conditions. The result is that engines using this type of igniter use too much fuel a part of the time and a part of the time give less power than is possible, simply hecause the ignition is not taking place at the proper time and regularly.

But hy far the most common method of gas engine ignition is by the use of electricity in some form or other. There are a number of plans of doing so. First, there is the "make and break" method. In this method two electrodes or arms are hrought together on the inside of the cylinder. One of these is stationary and is insulated with mica or other suhstances. The other electrode is movahle. The two are connected on the outside of the engine to a hattery and spark coil. At the proper time on the compression stroke, the two points are separated and a spark jumps hetween them as they separate, making the ignition. In order that this method he successful the hattery must he strong, the spark coil must he as short as possible and effective, the insulation of the stationary electrode must he perfect, and the igniter points must he free from carhon or rust which may partially or entirely insulate them. A large numher of materials are used for the igniter points. Platinum is very common and is hard, hut it is expensive and often honeycomhs in short time, spattering the spark. German silver is often used, hut is soft. Ahout as satisfactory a method as I know of is to use hard steel for hoth points, or German silver on the stationary electrode and hard steel on the movahle. In Mexico, where peculiar conditions of climate and fuel are met, one user reported that he secured the hest result by using a steel point on the movahle electrode and on the insulated electrode a point made of 75% silver and 25% copper.

Then there is the "wipe spark" method. In this plan one of the electrodes usually consists of a flat steel spring, which is ruhhed slightly on the stationary electrode hefore separating from it and causing the spark. This ruhhing motion is intended to keep the points free from rust or deposits of carhon. It is objectionahle, however, on account of having a spring in the comhustion space subjected to a very high temperature, which is likely to spoil the temper of the spring. The igniter points also wear very rapidly under the chaffing section.

The "jump spark" method is hecoming more and more liked, especially with automobile manufacturers. The principal advantage of this method is that there are no moving parts inside the cylinder, hut the "points" are placed stationary a short distance apart. The current is made and hroken outside of the engine cylinder, causing a spark to jump across the two points. Its main objection is that the carhon deposits on the points vary rapidly, causing cleaning of them to he necessary very frequently.

Further, there is the method of using a sparking dynamo or magneto, or of taking current from an electrical generator which may he used for producing lights or running machinery. These are more or less similar, hut with the sparking dynamo it is necessary to use a battery in order to start the engine. But after the engine is in motion the hattery can he cut out.

The method of connecting up to a general commercial current is not commonly understood, and the sketch given herewith illustrates the methods employed. As will he noted, the wires are not connected up hack of the lamps, in order to shunt the current through the lamps and reduce the voltage. It is best to use a hattery with a douhle switch, as indicated, so that the hattery can he used in case of a shut down at the central plant. Or, in cases where the current is from a generator run hy the engine, it is necessary to have the hattery in order to start the engine. Of course, the hattery is cut out after the engine is started, and it therefore lasts a long time without renewing.

Where a hattery is used in any of the methosp named, it must, of course, he only of the best. Automohile users find it convenient to use a sal ammoniac hattery, as the renewals can be secured at any drug store or the supply can easily he carried along. Still, if the hattery happens to need renewing on the road, it is necessary to wait for the solution to cool, and in preparing it one is suhjected to a certain amount of inconvenience, such as getting it on the clothing, etc. One enthusiast has to admit that, in spite of the convenience, the "stuff spoils his tan shoes."

For ordinary power purposes, however, the sal ammoniac hattery does not answer. In the first place, it does not give a strong enough spark, and, in the second place, runs down too soon. While the renewals cost but little, much valuahle time is often wasted if the battery gives out unexpectedly.

Dry hatteries are frequently used and with good results, especially for portable work. The difficulty with them seems to be that they are not standard. Sometimes one will give out in a few days, while another, taken from the same shipment and suhjected to the same tests and given the same care, will last for months. This is true to a certain extent of the liquid hatteries also. I know of some of these which have heen in constant use on small engines running at high speed and on full load, where the hattery seems to be as strong as it was two years ago when put in. These are exceptional cases, however, and even the hest hatteries can not ordinarily he expected to last more than six to eight months under average usage. A battery may he compared to a hucket of water. If you take a drop out every second for ten hours a day, and continue to do so every day, the water supply will not last as long as if you take out a drop but once every half minute for eight hours a day. In other words, if a hattery is used day in and day out for ten hours a day, it will deteriorate sooner than if run seven or eight hours only two or three days a week. Small engines run at a higher speed than large sizes and therefore require more explosions per minute, so that they draw on the spark supply more than large engines. Engines on full load also require more explosions per minute than those on light load, i. e., in the "hit and miss" type. Therefore, it will he seen that throttling engines (which take a charge continuously), or hit and miss engines which operate the sparker continuously whether a charge is taken in or not, both run a battery down quicker than hit and miss engines which cut the sparker when a charge is not heing taken in and exploded. It is also seen that the amount of load on the hit and miss engine and the speed at which an engine is run affect the life of a battery.

In cold weather it often occurs that the operator does not know how cold a temperature a liquid hattery will stand without freezing or heing injured. The manufacturers of a make of battery which is very largely used for gas engine purposes state that the sealed liquid hattery which they recommend for portahle use will not stand as low a temperature as the hattery for stationary engines. The sealed hattery, so they state, can he exposed to a temperature of zero F. without the solution congealing. The other hattery, however, will stand as low as 15° to 20° helow zero without freezing. They state that "the availahle current from the hattery diminishes as the temperature falls, and this is especially noticeable helow zero. This decrease in current output is due to the increase in internal resistance, which rises inversely as the temperature falls.—American Manufacturer.

The Cyclone Pulverizer.

The accompanying illustrations show a new form of pulverizer, and also a new fine grinding mill or disintegrator, which is heing introduced in this country hy E. H. Stroud & Co. of Chicago as agents and manufacturers in the United States, Canada and Mexico for the Central Cyclone Co. of London, England. These machines, it is claimed, are especially adapted for service where uniform work and fine grinding are required, and will do especially good work on gold, silver, copper and lead ores which have to he ground fine, also on gypsum, graphite and in preparing powdered coal fuel.

Fig. 1 is an outside view of the pulverizer, while Fig. 2 shows the disintegrator with the cover raised to illustrate the construction of the machine. It is stated that the pulverizers can he "set" to make any particular fineness of powder and the machine

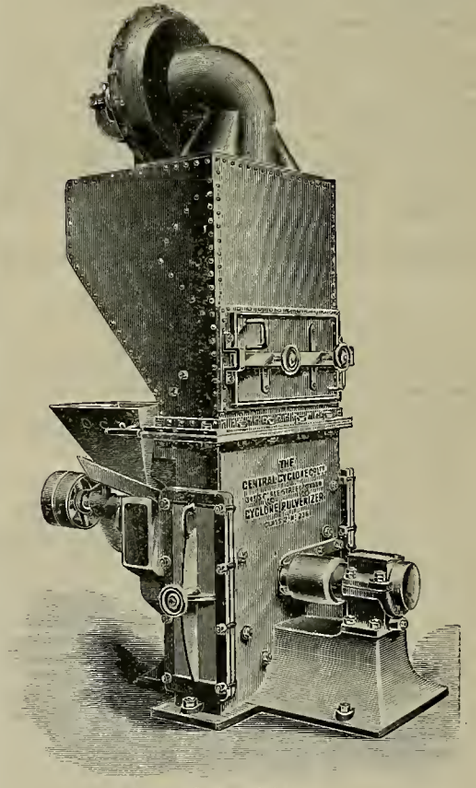


Fig. 1.—Cyclone Pulverizer.

will not only grind the material, hut will also automatically separate the ground product and deliver only such a uniformly fine product that hetween 90% and 95% of it will pass through the mesh desired.

In grinding, the heater arms drive the material round at considerable speed and heat it hetween themselves and against serrated plates of hardened metal (especially made for this mill), with which the sides and periphery of the mill are lined, until it hecomes small enough to fall through the screen or grating of a disintegrator, or to he carried off hy the air current in a pulverizer, as the case may he. The rotating star or mill wheel is, hy reason of its high

velocity of rotation, under considerable strain, but the manufacturers claim the design of these mills is such that the maximum per square inch can not exceed 3300 pounds. The speed of these machines varies from 4000 revolutions per minute in the small-

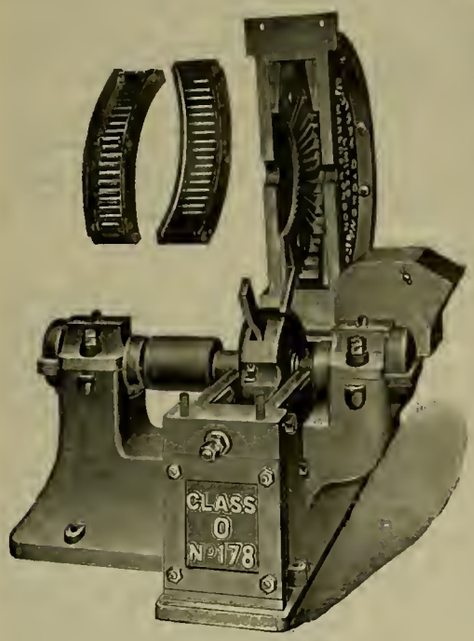


Fig. 2.—Cyclone Disintegrator.

est size to 1200 in the largest size, and the rim velocity of the grinding wheel is from 15,000 to 19,000 feet per minute.

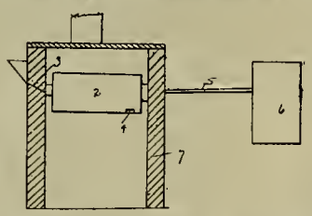
The two machines work on the same principle, but the disintegrator discharges through an adjustable grating or screen in the bottom of the mill, while the pulverizer is provided with a separation hood and an exhauster, the fine particles being separated and carried off by the air current, when reduced to the required size.

Mining and Metallurgical Patents.

Patents Issued February 25, 1902.

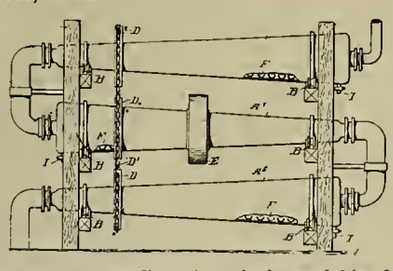
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

PROCESS OF REDUCING CARBONACEOUS ORES.—No. 693,982; R. McKnight, Philadelphia, Pa.



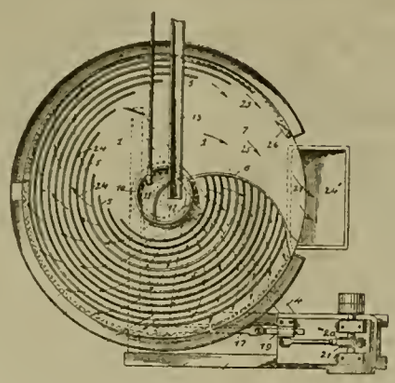
Heating the ore in presence of sulphur, until carbonates are converted into sulphur compounds, and continuing heating in presence of a haloid salt of an alkaline or alkaline-earth metal, with access of air, until alkaline metal or alkaline-earth metal combines with sulphur and with oxygen to form a non-volatile sulphate of alkaline or alkaline-earth metal, and liberated halogen unites with precious metal, as a haloid salt or an oxyhaloid of precious metal, and volatilizing and collecting haloid or oxyhaloid salt.

AMALGAMATOR.—No. 694,201; J. R. Sawyer, Arroyoseco, N. M.



A frame, a plurality of conical revoluble drums mounted one above the other in frame with ends projecting beyond same, axes of drums being in horizontal planes and drums being arranged with base end of one opposite apex of drum below, means for revolving drums in unison, cups on inside of drums and adapted to contain mercury and arranged to discharge mercury upon material as drums revolve, means for feeding material into projecting base end of uppermost drum, and stationary pipes connecting ends of drums outside of frame, each pipe leading from apex of one drum to base of drum next below.

ORE CONCENTRATOR.—No. 694,005; W. G. Dodd, San Francisco, Cal.

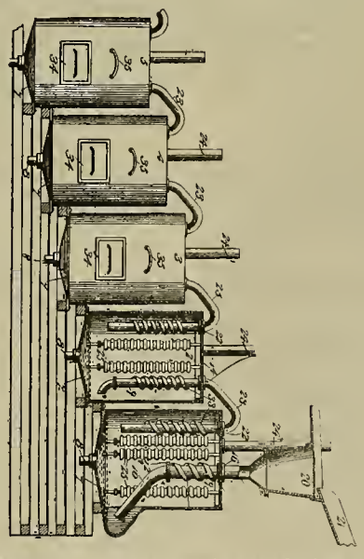


Cone-shaped table mounted to oscillate around a central vertical axis, a plain or unriffled portion to table, a pulp and water distributing box arranged to distribute pulp and water at apex of cone, a series of downwardly inclined curved riffles arranged on working face of table and extending onto plain or unriffled portion, discharge end of each riffle being beyond that of riffle immediately above, and means whereby an oscillating motion is imparted to concentrating table.

BLASTING FUSE.—694,271; N. Harris and J. Bray, Russell Gulch, Colo.

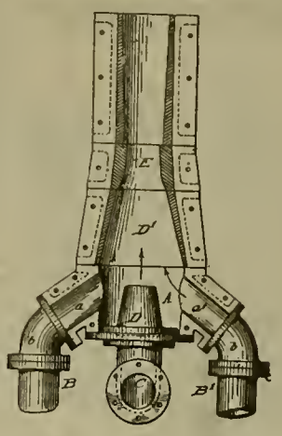
A cord-like combustible member adapted to be cut into arbitrary lengths and provided with ancillary combustible members for igniting it, ancillary members being of tapering form for purpose of enabling them to be readily folded against cord-like member without breaking, ancillary members being disposed at definite intervals on cord-like member.

FINE-GOLD AMALGAMATOR.—No. 694,290; M. Lasswell, Spokane, Wash.



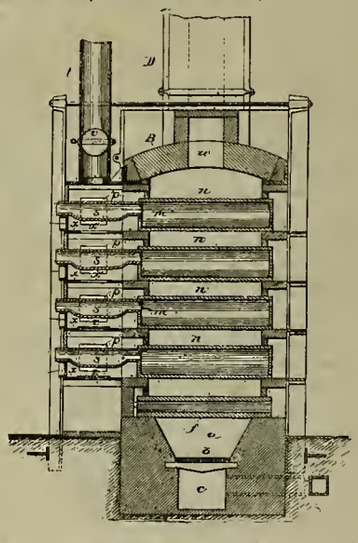
A stationary container having a sloping bottom which provides a mercury chamber in its base, an inlet pipe provided with curved nozzle adapted to discharge water, sand and gravel laterally in one direction against wall of container above surface of mercury so as to cause water, sand and gravel to rebound in opposite direction over surface of mercury, avoiding agitation of latter, an outlet pipe, and spiral amalgam plates encircling inlet and outlet pipes.

MINING ELEVATOR.—No. 694,002; H. W. Davis, Auburn, Cal.



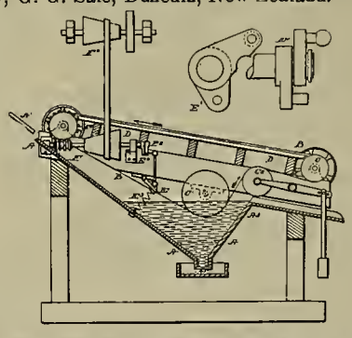
An exterior casing formed in sections placed end to end, and each section formed of a plurality of arc-shaped parts placed edge to edge, and all formed with vertical ribs and horizontal flanges, whereby they are secured together to form a connected tubular structure, an inner lining composed of a number of single-piece tubes abutting end to end and held inclosed by exterior sectional casing, a base section in two parts, each being formed with halves of two suction passages, abutting ribs by which halves are secured together, an upper flange by which base section is connected to lower casing section, flanges on suction halves by which they are connected to suction pipes, and an injector entering base section.

ZINC FURNACE.—No. 694,137; G. G. Convers and A. B. de Saulles, South Bethlehem, Pa.



A retort chamber for circulation of products of combustion, a plurality of retorts or muffles arranged in vertical series within chamber, a cooling flue chamber common to all retorts and adjacent to vapor discharge openings of retorts, zinc condensers extending through cooling flue chamber, and means for creating a cooling draught through flue chamber.

CONCENTRATOR FOR GOLD BEARING MATERIAL.—No. 694,199; G. G. Sale, Dunedin, New Zealand.



A concentrator employing an endless belt, a beater mechanism for belt, comprising a frame, a horizontal shaft carried by frame and adapted to rotate belt, means to transmit power to shaft, a rigid crank mounted upon shaft near its end, a loose crank mounted upon end of shaft and adapted to be tilted at each revolution of shaft by rigid crank, a rod connected to loose crank, a pivoted flapper connected to under side of frame and also to rod, said flapper being adapted to be raised at every revolution of shaft, and a spring for returning flapper, rod and loose crank with a sudden jerk to beat the belt.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

KETCHIKAN.

A. O. Hellan of Seattle, Wash., has bonded from C. R. Barton twenty-three quartz and placer claims on Hastings Arm, a branch of Portland Inlet in southeastern Alaska, at $125,000. The quartz ledges are said to be wide and to assay well. The bond covers several tracts of placer ground, the prospecting work on which is said to make a paying showing.

At the Sea Level mine at Sealevel, near Ketchikan, the mine buildings are all complete and ready for the mill and hoisting machinery, which, including the pipe for the water power, is reported to be on the way. The right of way for the power pipe line has been cleared. Work in the triple compartment shaft has been suspended until the hoisting machinery can be put into operation.

ARIZONA.

GRAHAM COUNTY.

Work has been commenced on the Mercer tunnel at the head of Pinto and Mineral creeks, near Clifton, and is expected to continue without interruption until it is in 2000 feet. Work on a mile of wagon road to the tunnel has been started. W. H. Mercer is Supt. and J. A. Valentine is his assistant.

H. Setzer of Bridgeport, Conn., president of the Stevens Copper Co. at Clifton, has bought from B. M. Crawford and J. F. Nicholls several claims which have been added to the Stevens group. C. L. Stevens, one of the original owners of the group, is Supt. It is the intention to push development rapidly. An electric power plant is under contemplation.

MARICOPA COUNTY.

The Copper Bar M. Co. in the Buckhorn mining district, near Wickenburg, has bought a group of claims with several veins of high-grade copper and gold ore. The veins vary in width from 3 feet to 20 feet and all carry chalcopyrite. The president, G. M. Cake of Los Angeles, Cal., has arranged for road building and machinery to operate the mine. Shipments will be made to Wickenburg.

The Socorro mine, near Wickenburg, is being worked by Hartford, Conn., people, incorporated as the Socorro G. Co., with Mr. Wetherly as manager. The developments consist of a 300-foot shaft and 400 feet of levels. The company is about to put in a 20-stamp mill, a hoist and a pump of 18,000 gallons capacity, the latter to bring water through the 3-mile pipe line from Centennial. Mr. Wetherly proposes to work all the tailings by the cyanide process. The expenditure already made is said to be $20,000, and when the plant is in place $100,000 will have been paid out.

B. O. Hatfield has sold his one-sixth interest in the Oro Grande mine at Wickenburg to his partners, G. E. Lamb, F. W. Ellis and G. B. Upton, for $100,000.

The Denver Group G. & C. Co., at Wickenburg, has its tunnel in 450 feet, and additional contracts will be let to continue it until the ledge is crosscut. A. H. Gamage is Supt.

MOHAVE COUNTY.

At the Sheeptrail mill, near Kingman, Supt. Bagg has made a test run of seventy-five tons of $10 a ton ore, recovering $6 a ton from the plates and battery. A cyanide test is now being made on the tailings. The company will probably install a cyanide plant. An estimate of the cost of mining, hauling and milling is given at less than $3 per ton.

H. A. Cohen, representing Capt. De Lamar, has made arrangements for the starting up of work on the Ben Harrison and Tom Reed mining claims, in the Hilty group, near Kingman. One shaft will be sunk at once and later another shaft will be commenced. E. Hilty is Supt.

The Philadelphia & Arizona M. Co. will sink the main shaft of the Minnesota mine at Chloride to the 500-foot level to obtain water for the mill. Supt. Loy is to rush this work.

YAVAPAI COUNTY.

The Crown G. M. Co. has bonded the Alma mine on Groom creek. The company is composed of W. P. Rice and associates of Los Angeles. Supt. Mansfield is installing a 35 H. P. boiler, a gallows frame, pumping plant and other machinery, and has let a contract to sink the first 100 feet of a 500-foot shaft.

The new shaft in the United Verde mines at Jerome is about 10x30 feet in the clear, with three compartments, strongly timbered from the top to the 700-foot level. It is connected by drifts with each level, through which electric trams will convey the ore to the cages. The surface equipment will be a high-speed hoist with a capacity of hoisting from 2000 to 3000 feet depth. The gallows frame will be of steel.

Supt. Pickrell is reported to have the shaft down 350 feet on the President group, and has kept a 10-stamp mill steadily at work on ore taken out in development work alone. The mine is located in Hassayampa district, near Prescott.

J. Phillips has bonded his group of three quartz claims in the Hassayampa district, near Prescott, to a Mr. Standish of Los Angeles for $25,000. The development work has been done on a ledge 10 feet wide, ore from which gives assay values of from $7 to $11 a ton gold. It is stated that Mr. Standish will immediately commence work on a tunnel which he will drive in 1200 feet.

At the El Capitan mines at Bigbug, being operated by Douglas, Lacey & Co., a shaft down 40 feet shows ore in the bottom that carries 21½% copper, in addition to other metal values.

The Copperopolis group of seven claims owned by E. W. Fisher of Briggs, Ariz., is situated in the Castle Creek mining district. A lode has been opened which is from 60 to 100 feet wide. It is low grade, but carries shoots giving values in gold from $10 up and copper from 10% up. On one shoot there is a shaft 200 feet deep equipped with a 12 H. P. gasoline engine and a Cornish pump. The mine water carries considerable copper in solution.

CALIFORNIA.

AMADOR COUNTY.

Work on the twenty additional stamps of the Central Eureka mill at Sutter Creek is expected to be completed by the middle of April, when the entire forty stamps will be started up on the accumulated ore.

At the Wildman-Mahoney mines at Sutter Creek the Wildman shaft is now retimbered and repaired nearly to the bottom. Good ore is being taken out from some of the upper levels. Sinking is now in progress at the Mahoney shaft, which is down something like 1200 feet. J. Ross is Supt.

At the Lincoln mine at Sutter Creek the main shaft is now down 1870 feet. It is estimated that it will take about two months more to complete the sinking to the 2000 level, where a station will be cut and a crosscut started west for the vein.

Some very good ore has been found in the Oneida mine at Sutter Creek on the 1850-foot level. The 60-stamp mill at this mine is crushing from 9000 to 10,000 tons per month.

In the Bay State mine, near Plymouth, the vein which the shaft follows has been struck about 80 feet east of the 750-foot station. The ore bin at the mill is being filled with rock from this new discovery and the 10-stamp mill is to be started up. Power drills are being used. J. Ross, Jr., of Sutter Creek, is Supt.

CALAVERAS COUNTY.

The Parnell mine, at Smith's Flat, owned by H. S. Messer of Altaville, after lying idle for twenty years, is being operated under bond by a San Francisco party, and workmen are now engaged in pumping out the water from the shaft.

The Bradley & Osborne mine, situated near Altaville, has been bonded to San Francisco people. There is a tunnel on the vein for 300 feet and a shaft down 90 feet. Work has been resumed and the main tunnel is being extended farther.

EL DORADO COUNTY.

At the Zantgraf mine, near Auburn, the main shaft is being retimbered, and when completed it will be sunk 250 feet farther, to intercept the contact of the Montauk and Zantgraf ledges. The rebuilding of the mill is postponed, but a new air compressor and hoist have been installed on the mine.

Sulphurets from the Mt. Pleasant mine, at Grizzly Flat, are being shipped to the smelters.

A 10-stamp mill has been built at Georgetown for J. H. Moore, who proposes to do custom work and test the ores of the various mines in that vicinity.

MARIPOSA COUNTY.

A. P. Dron of the Nonpareil M. Co. of Mariposa and the Merced M. Co. are reported to be arranging to bring in the Golden Rock Water Co.'s ditch to insure a supply of battery water all the year around to both mills, while the Nonpareil would probably be run by water power.

NEVADA COUNTY.

The Grass Valley Con. M. Co. is planning to install a telephone and electric lighting system in the underground workings of the mine at Grass Valley, and for the installing of a four-drill compressor plant. Every station in the shaft will be fitted with a telephone box. The landings and all the main parts of the workings will be lighted by electricity.

The Eagle Bird mine at Maybert is to be worked during the coming summer. W. L. Raeder of Wilkesbarre, Pa., one of the large owners and president of the company, visited the mine and stated that it is the intention of the company to start in a short time. W. M. Wilson will continue to act as Supt.

The New Independence Quartz M. Co. has been incorporated in San Francisco, capital $250,000, with C. M. Root, R. M. Dunne, W. B. Simmons, F. E. Harmon and R. J. Simmons, Jr., all of San Francisco, as directors. Under the superintendency of C. M. Root, the company is developing under a bond the Independence quartz mine, situated near Wolf.

At the Home mine, at Nevada City, thirty stamps are at work. Fifty men are employed. A depth of 700 feet has been reached in the shaft. D. J. McFall is Supt.

At the Eclipse mine, on Gold Flat, Nevada City, Supt. B. Hosking has sunk the shaft about 60 feet, making a depth of about 350 feet. In the bottom the ledge shows about 15 inches wide, and it is estimated that some of the ore will yield as high as $60 to the ton.

H. K. and D. T. Hedges of San Francisco have been preparing to build a custom cyanide plant on Deer creek, near Nevada City.

The Brunswick mine incline at Nevada City is down 1275 feet, and a station is being cut. From there the drifts will be run to tap the ledge and the pay shoot which was in evidence in the levels above. Supt. Mallen is pushing the work.

Canfield & Co., who are opening up gravel property on Shady creek, near Nevada City, have completed the work of constructing a large dam to store water. Large quantities of debris are being removed preparatory to reaching virgin ground, which it is believed will pay well.

The Hackett M., M. & Dev. Co. has been incorporated, capital $75,000, to operate mines, erect electrical works and dispose of power, with the place of business at San Francisco. The directors are J. Hackett, J. E. Ellis, A. M. McGill, C. Man and A. Barnard, all of San Francisco.

PLACER COUNTY.

The Big Gun hydraulic mine, at Michigan Bluff, has commenced operations.

The new company at the Black Canyon quartz mine, at Westville, will erect a 20-stamp mill. J. Ruiz has taken the contract to freight it from Washington, Nevada county, to Black canyon.

SACRAMENTO COUNTY.

W. Murdock of the Gray Wing mine, at Folsom, says the mine is richer than ever. They have 16 feet of gravel and a 150-foot crossdrift shows no signs of rim rock.

SAN DIEGO COUNTY.

J. F. Delgado, M. E., of this county, has taken a bond from A. W. Pray, J. R. Upton, S. T. Case and H. H. Case of Escondido to the Palagonite stone mines, near Escondido. It is said that the mines contain valuable deposits of a particular kind of stone, which is found only in one or two places in the United States.

SIERRA COUNTY.

Gravel has been struck in the Belcher mine at Monte Cristo, near Downieville, after raising 112 feet. The gravel is encountered on the west rim of the channel and the bedrock is pitching toward the east into the hill. The tunnel is in about 725 feet. The gravel prospects well. The property is owned by the Fir Cap Con. M. Co. of San Francisco, W. J. Belcher manager; J. Erwin is foreman.

SISKIYOU COUNTY.

The Portuguese Co., at the head of Greenhorn creek, near Yreka, has discovered a 14-foot ledge, with quartz averaging from $6 to $8 per ton.

The Boyle quartz mine, in Humbug, near Yreka, it is reported, is to commence operations again, after being idle for several years. This mine is equipped with a 5-stamp Huntington mill. It has changed ownership recently.

The Blue Ledge, about 30 miles south from Medford, Or., is a low-grade proposition, assaying about 5% copper, with $4 in gold and silver. The size of the ore shoot on the surface is claimed to be enormous. A drift has been run 160 feet, and a crosscut has been driven for about 26 feet, both all in ore. To operate the mine it will be necessary to build 35 miles of railway to it at a cost of $350,000, and a smelter will have to be built to treat the ore at the mine.

Green & Harrison are working on a porphyry dike claim at Deadwood, near Yreka, and obtaining considerable coarse gold.

TRINITY COUNTY.

W. Sublett and T. F. Edmons located the Texas Jack quartz mine on Indian creek, near the dividing line between Shasta and Trinity counties, about two years ago. They bought an old 3-stamp mill, removed it to the Texas Jack mine and have taken out $30,000 with it.

Owing to the heavy rains of February, the Brown Bear mine, at Deadwood, has closed down until the weather settles. Supt. Dobler considered the continued working of the mine with the excessive rainfall unsafe, and, to avoid the chance of accident, closed the mine temporarily.

TUOLUMNE COUNTY.

The Mt. Jefferson mine, at Groveland, is said to show a large vein of fair-grade ore, through which the shaft is being sunk.

A double-compartment shaft is being sunk on the Eberhardt mine, at Campo Seco, by the company which a short time ago bought the property.

It is reported that a rich strike has been made in the Chapparal mine, in the Buchanan district, the property of F. Wenzel of Sonora.

COLORADO.

BOULDER COUNTY.

The Nancy tunnel, being driven from near the new chlorination mill at Wall Street, is 1263 feet in. The tunnel plant comprises power drills and machinery for considerable additional length. Besides cutting the Lucky Star vein the tunnel will cut a number of other properties below the bottom of their workings through shafts.

CHAFFEE COUNTY.

It is reported that the Chance mine, at Whitehorn, has been sold to C. L. Arzeno, J. McConoghy and C. F. Rickey of Cripple Creek. It is the intention of the new owners to repair the buildings and equip the mine with a plant of hoisting machinery.

Manager R Taggert of the Tasmania Copper M. & M. Co., at Winfield, has been prospecting the Last Dollar vein and has opened several new bodies of high-grade ore. In addition to the high-grade sulphuret zone, there are from 8 to 12 feet of quartz on the hanging wall, carrying from 5% to 7% copper, with some values in gold, silver and lead. To handle this low-grade ore a tramway is to be built 3000 feet in length, which will dump the ore into the smelter bins.

CLEAR CREEK COUNTY.

(Special Correspondence).—The operations of the American Gold Standard mill are of interest, as they constitute the first trial in this county of concentration and cyanide work combined. The work comprises wet crushing, table concentration and pneumatic cyanide method of leaching. Cyanide solution is used in crushing and table work, the tailings passing to the leaching vats. The ores are an iron and lead sulphide, with a small per cent of copper, and pretty siliceous. The heavy sulphide product is saved by the tables, the siliceous and oxidized material in the slimes yielding to the cyanide work. Manager L. G. Linn, it is claimed, saves by this method 93% of the gold and 73% of the silver. Three Wallace mills are in use as pulverizers.

Idaho Springs, Feb. 27.

The property of the Consolidated Alpine G. & S. M. Co. at Idaho Springs has been sold to Evansville, Ind., people, who will immediately develop the property. They have incorporated with O. F. Jacoby of Evansville, Ind., president, and W. H. Gilbert of Evansville, Ind., secretary. T. B. Crow of Idaho Springs is manager. The company will erect a new shaft house and install a hoisting plant. The shaft will be sunk an additional 600 feet, which will give a total depth of 900 feet.

Prof. Carpenter of the Golden smelter has shut down and will more than double the capacity of the plant for the ores from the Saratoga mine, which will be taken out through the Newhouse tunnel. By the time the additions are completed it is expected that the vein will have been cut. The company is now putting in the new air compressor at the mine for the purpose of drifting out near the line of the tunnel and then sinking a winze from the present 1000-foot level of the Saratoga. Then all of the ores will be dropped through it to the Newhouse tunnel, which opens the vein at a depth of 2200 feet from the surface. Present plans are for the handling of about 800 tons of the crude ore per day.

W. H. Ross, of Grand Junction, manager of the company operating the Mint property at Georgetown, says that 130 feet have been driven since January 15th, an average of over 3 feet per day. A dynamo has been bought to furnish power for the electric drills. An oil engine is to be installed.

The shaft on the Banty in Spring gulch, Idaho Springs, is down 250 feet and will be continued to the 300-foot level. A 60 H. P. air compressor will be installed early in the spring.

It is reported that R. C. Vidler of Idaho Springs will push his Horseshoe tunnel through the range under Argentine pass. As soon as Mr. Vidler can complete arrangements, a plant of machinery will be installed on the tunnel, which, as pro-

jected, will be from 7000 to 10,000 feet long.

The Republic Con. Co. has cleaned out and retimbered the 300-foot crosscut on the Ruby property, near Empire station. Square timbers are used throughout. F. H. Collins, president of the company, is acting as Supt.

EAGLE COUNTY.

The Emma M. Co. of Denver, operating in Eagle county, has elected S. P. Sloss president and E. B. Kelly secretary. The company has let a contract to sink 50 more feet on the claim.

GILPIN COUNTY.

At the Barnes mine, Central City, the shaft is down 580 feet deep. Drifting and stoping is being carried on in the 400 and 500-foot levels. A good production is being made both of concentrating and smelting ores. The mine is owned by Milwaukee people, and operated as the Horseshoe G. M. Co., with N. H. Scheuer as Supt.

The Bertha M. & M. Co. has bought the Carcassone mine in Elkhorn gulch, near Russell. The company proposes to install a new plant of machinery and to continue sinking the shaft, which is now down over 200 feet.

The Kokomo mine, in Willis gulch, is operated by Boston people, with W. H. Adams as manager, and considerable concentrating ore is taken out and treated at the mill owned by the company at Dumont, in Clear Creek county. The ores show a good percentage of lead. In a winze below the 300-foot level some fine looking copper ore has been opened up.

GUNNISON COUNTY.

Mr. Genson, the manager of the Forest Hill M. & M. Co. of Taylor park, says a site has been selected 2 miles from the mine at the nearest point at which a water supply for milling could be obtained. A tramway will be constructed early next season from the mine to the mill, and transportation of ore will be made for, approximatley, 15 cents a ton. Late tests from dump ores from the Tourist shaft having an average value for the crude ore of $9 per ton, resulted as follows: Four grades of concentrates were secured. First a clean lead product, comprising .83 ounce gold, 27 ounces silver, 80% lead and 1% silica and zinc; second, a lead and iron product, carrying .65 ounce gold, 31 ounces silver, 31% lead, 2% silica and 8% zinc; third, an iron product, carrying .14 ounce gold, 31.4 ounces silver, 14½% lead, 20% silica and 6% zinc; fourth, a zinc product, carrying .08 ounce gold, 13 ounces silver, 4% lead, 5% silica and 37% zinc. The developments made indicate the present mill to be inadequate in capacity for the ore blocked out and on the dump, and plans are under consideration for its enlargement next season.

HINSDALE COUNTY.

Development work on the Lillie mine, at Lake City, under G. Staples, Supt., is progressing. The pipe line for the power plant has been taken up to the ground.

LAKE COUNTY.

The Cord M. Co. has been incorporated at Leadville by W. H. James, W. W. Davis and C. N. Priddy, with capital $125,000. The company is formed to consolidate a portion of the ground along the line of the Yak tunnel with the Silver Cord property.

LARIMER COUNTY.

In the Wolverine mine, situated near the State boundary line between Pearl, Colo., and Grand Encampment, Wyo., besides a lead of copper ore there has been opened a mineral formation nearly 200 feet wide, carrying zinc, tin and nickel in considerable quantities, together with gold, silver, lead, antimony and bismuth.

OURAY COUNTY.

A group of Red Mountain properties—the Forest Queen, Last Chance, Great Western, Sundown and other claims—near Ouray, have been sold to A. E. Cox of Huntington, W. Va. A 1000-foot tunnel will constitute the initial development.

——Another company is to buy the Maud S. and J. I. C. properties. These latter carry a smelting ore. It is expected that the Saratoga pyritic smelter will be built in the north end of Ironton.

It is said that an English company has secured control of a group of claims in Ice Lake basin, near Ophir, and will start up on June 1st on an extensive scale. J. L. Russell of Denver is interested in the enterprise with the English company which is represented by J. M. Gallow. The development contemplated is a 200-foot shaft for the Grand View and a 600-foot crosscut tunnel to cut the Last Hope vein. The milling plant will be newly equipped.

PITKIN COUNTY.

President P. Hagerman of the Mollie Gibson mine at Aspen, in his annual report says: "During the year the mine produced a practically continuous supply of ore for the mill, the total amount of concentrates and smelting ore shipped having been 4607 tons, as compared with 4802 tons the previous year. The gross value per ton of ore milled decreased from $8 03 to $7.62. There was a large and unavoidable increase in cost of mining, pumping and renewals and additions to plant, and also a considerable increase in freight and treatment charges. The increase in expenses, amounting to about $35,000, was caused principally by the large amount of development work done and the increased cost of handling water from the thirteenth level." The report of the treasurer shows that the company has cash on hand amounting to $54,599.45. The gross receipts from ore sales during the year amounted to $206,560.52, but the mining, shipping and mill expenses reduced the net profit at the mine to $13,-274.18; and after other expenses, such as legal and general expenses, taxes and salaries amounting to $5100 had been taken out the profit for the year's operations came to $5246.28.

PUEBLO COUNTY.

J. Schulte, technical director of the Company of Metals and Chemical Products of Overfelt, Belgium, is in Pueblo to approve the plans prepared for the construction of the $1,000,000 zinc smelter to be erected by the United States Zinc Co. The new plant will occupy 500 acres and will have a capacity of 250 tons of ore, using 500 tons of coal per day and employing about 1000 men. The ores for treatment will be obtained from Leadville, Kokomo, Aspen, San Juan, Clear Creek and Gilpin counties. It will take ores carrying as low as 30% zinc.

SAGUACHE COUNTY.

The Saguache Home M. Co. has been incorporated at Saguache, capital $15,000, with T. Noland, J. Slane, H. Tarbell, E. Williams, W. A. McIntyre and G. H. Davis, all of Saguache, as directors, and office in Saguache. To this company have been transferred the Dixie, Gold Dollar and the Crystal lode mining claims, in Findley Gulch mining district, near Klondike.

The Blanca Mutual M. & M. Co.'s property, at Liberty, in the shaft at 200 feet depth shows an ore body 4 feet wide. It is free milling. A 5-stamp steam mill has been erected. C. C. Chapin is manager.

SAN JUAN COUNTY.

The Menomic M. & L. Co. has been incorporated in Denver, capital $50,000, by B. Bloom, R. M. Ballinger and W. C. Baker, all of Denver. The company has a bond on the Menomic gold mine, near Silverton.

The winter work on the Peacock group, near Silverton, with a small force of men, has made a good showing of gold quartz, which has been drifted on 250 feet in one of the tunnels. Associated with the gold ore is a streak of tungsten ore, some of which is high grade. About 200 feet from this ore shoot another tunnel has been driven on a vein of tungsten ore which would pay with concentration. The property is owned by W. H. Moore and A. Lamson of Durango, with Maryland people. Some time during the coming season it is the intention of the developing company to put up a mill.

The Natalie tunnel at Silverton is being driven at a rate of 43 feet a week and the heading is now 1350 feet from the portal. The Occidental vein for which the tunnel is being run is believed to be within the next 100 feet. With the facilities of improved machinery and drills the company is doing its own tunnel work at about two-thirds the cost of contracting it.

SUMMIT COUNTY.

The Puzzle M. & R. Co. have purchased the Engel mill at Breckenridge and will put in new sets of Colorado Iron Works' rolls and Wilfley tables.

At the meeting of the French Gulch G. M. Co., at Breckenridge, P. J. Nevins was re-elected manager. The mine is to be started up about the middle of March.

TELLER COUNTY.

For the month of February the total production of ore from the Cripple Creek district amounts to 50,825 tons, which under treatment yielded the sum of $1,865,-437.50 gold. The figures given out by the smelters and the various mills buying this ore are as follows:

	Tons.	Per Ton.	Value.
Smelters	14,000	$60	$840,000
Colo. Standard	24,000	30	720,000
Union	9,500	23	218,500
Dorcas	2,625	25	66,937
R. M. Smelter	600	30	18,000
American Z. L. Co.	100	20	2,000
Total	50,825		$1,865,437

The Gold Dollar Con. Co. is planning a new plant of machinery for the main shaft on the mine at Cripple Creek. The plant is to be a cage equipment good for a depth of 1500 feet. The equipment at present is good for 150 or 200 feet of additional sinking. The output of the company and lessees is running at twenty tons of $30 ore per day.

The Portland Co., at Victor, is reported to have opened another large ore body. The ore is said to average three ounces gold to the ton. The find was made in the 500-foot level, north of the shaft, in what was supposed to be the wall of the vein.

IDAHO.

CUSTER COUNTY.

H. J. Luce, president, and H. K. Matthews, vice-president of the White Knob C. Co., near Mackay, have been examining that property and report 200 men at work, and a sufficient amount of ore blocked out to run the smelter for several years. The copper smelter now nearing completion will have a capacity of 600 tons a day.

IDAHO COUNTY.

The Alder Creek G. M. Co. of Lewiston has elected D. T. Denton of Duluth, Minn., president, and J. H. Grannis of Duluth secretary. The company owns 640 acres of placer ground north of Pierce City, on which men have been at work during the winter. It is expected to have the ditch dug and a giant at work by the first of April.

The Zena G. M. & M. Co., capital $1,500,-000, has been incorporated in Spokane, Wash., to operate two claims said to be near to the Dewey mine at Thunder mountain. H. C. Brown is president and F. L. Sutemelster, Jr., secretary.

The Thunder Mountain Star M. Co., capital $100,000, has been incorporated in Spokane to operate at Thunder mountain. J. S. Payne, E. W. Taylor, M. M. Arant, J. S. McCall and A. L. McDonald are the trustees.

OWYHEE COUNTY.

Sinking has been started from the 1400-foot level of the Black Jack mine at Silver City to make a connection with the Florida tunnel which is being driven from Dewey. The shaft or winze will be about 300 feet deep, 4x12 feet in size, and of three compartments. The sinking station is practically completed, and is about 40 feet in height, 36 feet long, and varies from 20 feet wide at the tunnel level to 5 feet at the sheave wheel. A holst, operated by compressed air, has been installed in the station. The tunnel is now considerably over a mile in length.

SHOSHONE COUNTY.

C. E. Burns is in charge of the work on the Leslie mine, near Wallace, during the absence of Manager Everett, and has started a 700-foot tunnel to reach the north ledge under the shaft, in which rich copper ore was found.

The St. Paul-Idaho M. Co., operating the Douglas group on Pine creek, near Wallace, under bond, has drifted 470 feet on the ledge, in ore all the way, some of it shipping grade.

The Gold Standard M. Co., which is opening up some deep placer ground on Pony gulch, between Wallace and Delta, has secured some additional placer claims from F. C. Gordon. D. Love of Murray is in charge of the work and a drain ditch is being run.

MONTANA.

BEAVERHEAD COUNTY.

J. E. Morse and A. J. Noyes of the Ajax mine in the Big Hole basin, near Dillon, say that the lead in the mine where work is now being done is 25 feet wide. A small quartz mill will be put on the property in the spring. The ore carries gold, silver and lead.

The Hecla Con. M. Co., operating at Glendale, in its twenty-first annual report of its manager, H. Klippenberg, covering operations during 1901, shows: Receipts from sources, $139,561.94; all expenditures (except dividends), $107,804.37. Net cash profit, $31,757.57. Two dividends, Nos. 149 and 150, were paid, aggregating $30,-000, and the surplus on Dec. 31, 1901, was $40,834.74. The total dividends paid, including the last two, amounts to $2,250,-000. The metal production during 1901 was:

	Silver. Ozs.	Gold. Ozs.
From ore	218,773.18	193.284
From furnace, barrings, etc	1,968.26	7.558
Total	220,741.44	200.842
	Lead. Lbs.	Copper. Lbs.
From ore	750,806	101,938
From furnace, barrings, etc	16,443	1,753
Total	767,249	103,691

The mine report of S. A. Barbour, Supt., gives the following statement of the expenses (labor, wood and mining timbers), and ore production of the company's mines at Hecla, for the year 1901, viz.:

Name of Mine.	Amount of Expenses.	Tons First-class Ore
Atlantis	$14,482.57	142
True Fissure	6,324.65	
Cleve and Avon	41,162.73	1790
Wood	2,557.35	
Mining Timbers	115 70	
Total	$64,643.00	1932
Trapper lease		12
Total tons ore produced		1944

The cost of mining the first-class ore, on the basis of the above table of expenses, was $33.46 per ton.

CASCADE COUNTY.

The Ripple mine at Neihart will be started up by the owners, P. M. Collins manager. The mine has been developed with tunnels, shafts and upraises at an expense of about $40,000, and since last November about $20,000 worth of high-grade ore has been shipped.

CHOTEAU COUNTY.

It is reported that E. W. King of Kendall has bonded the Alabama group and other claims near Landusky. They are cyanide propositions and belong to Putnam, Zortman & Reser. Some development has been done upon the Alabama claim and it is probable that if the bond is taken up a mill will be put on the property, as the ore is of too low grade to ship.

FERGUS COUNTY.

The Good Night and the Belvia, two cyanide claims in the Cone Butte district, near Lewiston, are being developed by J. W. Beam and F. Fuller, the owners. Samples taken at random from them run from $1.20 to $3.20 per ton in gold.

Four claims adjoining the J. T. at North Moccasin are being developed by Weaver & Goddell.

FLATHEAD COUNTY.

The equipment for a hydraulic placer plant is being hauled from Libby to the head of Libby creek by J. T. Vaughn and H. F. Greenwell, who will operate their placer mines during the coming season. Machinery is also being transported to the same district by the Howard P. M. Co., under Supt. F. Whitesides.

J. Brannagan, manager of the Fisher Creek M. Co. in the West Fisher district, near Libby, says that a snowslide completely destroyed the 10-stamp mill of the Blacktail M. Co. near his property. Sanford & Grubb of Kalispell are the principal owners.

GRANITE COUNTY.

The machinery of the 500 H. P. motor of the big 250-drill air compressor at the Bi-Metallic mine at Granite is being installed. One portion of the motor alone weighed fourteen tons and it required thirty-two horses to transport it from the railroad to the mine. The compressor will be the largest in the State. Power will be transmitted from the motor to the compressor by means of a rope drive, the pulleys for which contain nineteen grooves for the rope.

LEWIS AND CLARKE COUNTY.

Shipments of a carload of copper ore a day are being made from the Punches mine in Greenhorn gulch, near Helena. The shaft is down 270 feet on the incline and a crosscut is said to show from 12 to 20 feet width of solid ore. A big cave in the mine, surrounded on all sides by solid ore, has been discovered. The vein is on a contact between lime and granite. Punches started the mine up to supply the smelter with iron flux, and operated it a long time before striking the copper.

Work has been started by six men preparing for development on the Combination M. & Imp. Co.'s property at Greenhorn, near Helena.

MADISON COUNTY.

The sale of the Galena mine at Sterling by P. V. Jackson is reported to have been made by Butte people. Mikesell & Co. have been working the property under lease for several years.

The Butte & Potosi M. Co. has had eight men at work on its four claims near Pony and has driven a tunnel in 110 feet to the ledge. Nine feet of steel galena has been struck, carrying 60% lead, $48 in gold and twelve ounces silver. A drift has been run 300 feet along the ledge. The company, it is reported, propose to erect a 100-ton concentrator in the spring.

It is reported that in the Lester group of mines in Hulbert canyon, owned by J. Armors and R. Jeffries of Virginia, the main tunnel is in 570 feet and about 350 feet deep, showing the lead to be 26 feet wide. An average sample shows the gold content to be $8 per ton, and it is claimed to be good cyaniding ore.

MISSOULA COUNTY.

D. Lewis of Clinton states that an Eastern company, who are represented by J. A. Porter, have bonded two claims in the

Wallace district owned by A. B. Northey and C. Russell.

PARK COUNTY.

The annual meeting of the St. Julian M. Co., held at Livingston, elected W. A. Bercry of Detroit, Mich., president, and P. J. Nolan secretary and treasurer. The lead has been encountered in the mine and considerable ore developed, which runs about $50 to the ton. It is stated that the mill will be increased to 100 tons daily.

SILVER BOW COUNTY.

The Howard mine, C. A. Sheldon lessee, on Grizzly gulch, near Butte, is shipping two carloads of ore a month. The ore shoot is a pipe, sometimes narrowing to almost nothing and at others widening out into a good-sized chamber of gold ore which averages from $20 to $30 a ton,

NEVADA.

HUMBOLDT COUNTY.

The Sheba M. Co., with G. W. Bartch of Salt Lake, Utah, president, is making extensive preparations for the operation of their properties in the Star Canyon district, including the Mammoth group of eleven claims, as well as the Sheba group.

In the Silver King claim at Tuscarora, belonging to the Nevada Queen Co., after standing idle for about ten years, in December last work was begun on a small scale on the lode where it had been exposed in grading for the site of the Union mill, since removed. P. C. Hyman, Supt., has started sinking a shaft at this point and has found some very rich ore and is following it down.

LYON COUNTY.

Buckley, Davis & Daniels have struck a 15-inch ledge of high-grade ore in the Pat Kelley mine, about 3 miles north of Camhridge.

Farrell & Frost at Cambridge have the shaft on their mine down 350 feet, and at that depth are drifting on the ledge, taking out two tons of ore a day which goes about $20 per ton. The pay streak is about 3½ feet wide.

Davidson & Lockwood, who are operating on a claim near Camhridge, have let a contract to run another 100 feet of tunnel on the ledge. The ledge is about 1½ feet wide and is believed to be a good cyaniding proposition. Extensive development work will he done on this claim this summer.

NYE COUNTY.

The Tonopah M. Co. have a large number of men employed in sinking new shafts and erecting hoisting works, etc. Sinking is being done in the Brougher shaft on the Mizpah lode. It is now down about 250 feet, with the ledge in the hottom nearly 6 feet wide of ore that will mill $200 per ton. This shaft is being sunk to prospect depth, while the new three-compartment shaft is being sunk.

WASHOE COUNTY.

The Sparks M. Co, at Wedekind, is preparing to cut a station at a depth of 225 feet in the new shaft on the Reno Star mine. The roaster has been installed. The hrickwork of the new mill is nearly completed and the timbers have heen framed for the main structure.

A. Dondero reports an $1800 clean-up, the result of a short run on ore from the Cahin No. 2 mine, at Olinghouse.

WHITE PINE COUNTY.

Gray & Bartley are still developing their Ruth mine, at Ely, and state the quality of the ore continues to improve, the shaft now boing in solid copper sulphides.

In the Saxton mine of the McKinley group at Ely the shaft is now down 225 feet and drifts are being run on hoth levels. Manager McGill reports that the ore from the mine assays $97 in gold.

NEW MEXICO.

GRANT COUNTY.

The Allessandro Copper M. Co. has let a contract to J. H. Bates to sink an additional 75 feet on the Gettysburg mine at Burros. The character of the ore is mostly a low-grade copper carbonate and oxide from the surface to nearly 100 feet in depth. Below the 100-foot depth the ore is copper sulphide assaying from 6% to 15% copper. The company may erect a leaching plant to treat the low-grade ore.

SIERRA COUNTY.

J. Kasser has commenced sinking a well in Cold Springs gulch, near Hillsboro, with a view of erecting a stamp mill if he finds sufficient water.

The Las Animas Gold-Copper M. Co., operating the Wicks mine at Hillsboro, is continuing development work and adding to the large ore reserves. A 3½-foot wide ore body averaging $76 per ton in gold has heen struck in the 300-foot level.

P. J. Savage of Socorro has sold to the Abbey M. Co. two claims in the Pittsburg mining district, in the Caballo mountains, for $8000. The vein on the claims for their entire length is 70 feet wide between walls of lime and granite, and assays show 17% copper. The company proposes to at once put men to work to open up the mine. The company is also operating at Abbey, in Socorro county, under the management of N. Hall. In the mine at this place a large flow of water has been struck. Estimates are being made for a pumping plant that will enable the company to sink its main shaft to a depth of 700 or 800 feet.

A. G. Brower of Utica, N. Y., has completed arrangements with his partner, J. W. Orchard, at Hillsboro, to go ahead with the development of the Dude and Macho mine.

Colorado people have taken an option of D. S. Miller's claim and the property of W. Keil and J. Johe at Lake valley. It is their intention to buy hoisting machinery and to sink a 400-foot shaft.

SANTA FE COUNTY.

The Consolidated M. & M. Co.'s smelter of 100 tons daily capacity, at Cerillos, has been blown in and is treating eighty tons daily. The bulk of the ore is coming from Magdalena, where the company's mines are producing ores carrying silver, lead and zinc values. The company also contemptates the erection of a 100-ton concentrator, to cost $70,000, and 10 miles of railroad, which will afford transportation facilities for their own and other ores produced in the Cerillos district. It also contemplates building 18 miles of road into the San Pedro district and the Pecos fields, 13 miles distant.

VALENCIA COUNTY.

The Belen-Carricito Dev. Co. of Belen has elected P. B. Dalies president and C. A. Dalies secretary and treasurer. The company is working several claims in the Carricito district in the Manzano mountains.

OREGON.

GRANT COUNTY.

It is reported that the Badger mine at Susanville has heen honded at $500,000 by F. W. Bradley of San Francisco. Work has heen done on the Badger all winter, and several rich bodies of ore have been uncovered. An air compressor and power drills have been put in, and a $100,000 reduction plant is under consideration. The new town of Susanville is located at the Badger mine on Elk creek. The name of the old town of Susanville, which is quite a distance from the mine, has heen changed to Galena. A new postoffice has been established at Galena.

JACKSON COUNTY.

The Gold Hill M., Power & Dev. Co. has been incorporated to operate and develop mines in Jackson county and to operate electric light and power plants at Gold Hill. J. J. Houck, T. J. Kenney, J. Nunan and E. A. Reames are the incorporators.

It is reported that E. K. Anderson has bonded the Golden Fleece mining property, near Ashland, consisting of 200 acres, at $20,000, to W. C. Latham, president and Supt. of the Pacific M. & M. Co.

JOSEPHINE COUNTY.

The Andrews Placer, property of W. H. Andrews at Dry Diggings, has been hought by M. C. Ament for the Golden Drift M. Co. The property has heen incorporated with the greater Dry Diggings property, on which a hig pumping plant is to he installed to provide water for hydraulicking.

The Golden Drift M. Co. has heen incorporated, capital $1,500,000, to operate a hydraulic mine at Bloody Run, 3 miles south of Grants Pass. The plan provides for 1200 inches of water for the six giants, the water being pumped direct to the giants. M. C. Ament, manager of the Dry Diggings placer mines, is the manager.

SOUTH DAKOTA.

LAWRENCE COUNTY.

In the Bear Gulch district, near Deadwood, a California company has honded several hundred acres of placer ground until Sept. 1, 1902, from J. Treber of Deadwood, E. Grosfield of Spearfish. E. St. John, M. Heidloff and a number of others of Bear gulch. The people taking the bond undertake to develop the claims.

The National Smelting Co. is considering the converting of the old chlorination works at Rapid City into a custom cyanide plant, to be run in connection with the smelter.

PENNINGTON COUNTY.

The Lulu M. Co. has heen formed to operate the Lulu mine, owned by J. McClure and located near Hill City. J. R Wilson and M. R. Day of Deadwood, and J. McClure of Hill City are the incorporators. The capital is $500,000. Mr. Day is manager. The development work on the ground has opened up a vein of free milling ore.

It is reported that the Belt Dev. Co., which has been sinking a shaft and exploring the Homestake veins at Kirk, has decided to huild a 200-ton dally capacity quartz mill about 3 miles up Rapid creek from Silver City.

UTAH.

The Utah mines paid in dividends to their shareholders during the month of February the sum of $314,000, as follows: Silver King, $100,000; Quincy, $125,000; Daly-West, $60,000; Yankee Con., $25,000; May Day, $4000.

BEAVER COUNTY.

F. C. Morehouse, Supt., of Tintic, and L. G. Brown of Salt Lake, have bought the Lady Curzon group of seven claims near Milford from J. Forgie. A shaft is to be sunk on the vein at a point near the adjoining Copper King ground.

The Golden Reef M. Co. of Richfield, operating a mine located near Frisco, has decided to put in a hoist during the immediate future.

E. Mingle, manager of the Monte Cristo Co. of Salt Lake, has started work on the company's mines in Star district, near Milford. The property consists of the John Kempel and Good Luck claims. It is a silver-lead vein, with pockets of high-grade gold ore. The ore is free-milling. It is the intention to run the tunnel 125 feet for the purpose of prospecting the vein and then sink a shaft.

BOX ELDER COUNTY.

The Prince of India M. Co. of Salt Lake City, operating north of Ogden, has let a contract for 200 feet farther extension of its tunnel. The mine is a copper and gold proposition, owned hy Waltman Bros. and D. Maguire, who have associated with Eastern capital. The tunnel is now in 365 feet.

SALT LAKE COUNTY.

J. F. Leland, manager of the Moscow, Saginaw and Amelia claims at Bingham, owned principally by Columhus, O., people, has had a crew of men st work all winter. A hoarding - house has been erected and ore bins have been constructed, and tunnel work to the extent of 800 feet has been completed, giving the present workings a depth of between 400 and 500 feet. The ore bins now contain, Mr. Leland states, over 300 tons of ore, carrying silver, lead and gold of an average of about $25 to the ton.

SUMMIT COUNTY.

The Daly-West M. Co. has brought suit in the United States courts at Salt Lake City against the Quincy M. Co. The suit is brought for the purpose of restraining the defendant company from extracting ores from the ground within the vertical houndaries of the Daly - West Co.'s property at Park City, and further to confirm in its ownership and title the claim of the plaintiff company to all the ore bodies on the ground in dispute. Property valued at over $1,000,000 is involved in the suit.

TOOELE COUNTY.

The Mono group of twenty-three claims, located at the head of Dry canyon, near Ophir, has been worked during the winter. In a drift off the old tunnel, 2300 feet from the tunnel's mouth and 1300 feet below the surface, a rich ore shoot has heen struck. Samples assayed have given as high as 22.7% copper, 45.45% lead, 142 ounces silver and $3 40 in gold. The Mono M. & M. Co. is preparing to erect a mill on this property.

WASHINGTON.

The report of State Inspector of Coal Mines C. F. Owens for the year 1901 shows that the amount of coal mined during the year was 2,504,190 short tons, an increase of 86,156 tons over tho output of 1900. The amount of coke produced was 49,197 tons, an increase of 13,275 tons. He states that but for the use of oil for fuel to a considerahle extent in California the increase of the output over 1900 would undoubtedly have heen greater. The local demand for coke and coal, it is stated, is rapidly increasing. The total number of men employed in the mines is 4826.

COWLITZ COUNTY.

The Red Star M. Co. of Kalama has been incorporated, capital $750,000. R. E. Darnell is president and S. C. Cook secretary. The company will develop the Eli D. mine on the Kalama river.

FERRY COUNTY.

The Independence M. Co. has heen incorporated, capital $100,000, with E. D. Sanders, J. L. Prickett, A. G. Ansell, Van B. De Lashmutt, T. Olsen and W. M. Byers of Spokane trustees. The company will develop four claims located about 3 miles southwest of Nelson. A shaft is down 70 feet on the Independence claim, in ore which assays from $20 to $60 per ton in silver and copper. The vein is from 15 to 20 feet wide and will he developed from a shaft.

SPOKANE COUNTY.

The old Spokane City smelter has been sold to S. Grant, trustee for Detrolt people, for $8500, who will rehuild and operate it.

FOREIGN.

BRAZIL.

A new diamond field is reported to have been opened by a New York company, of which R. R. Fogel is president. The find is situated in North Brazil, 178 miles from the coast.

BRITISH COLUMBIA.

The lessees and owners of the Ottawa mine, at Slocan, have turned over tho mino to Pittsburg, Pa, people, associated with W. D. Wrighter of Spokane, Wash., who have bought it for about $45,000.

In the War Eagle's fifth annual report for 1901 Manager Kirby says: "From the seventh to the eleventh levels a new dopth of 700 feet on the vein is now accessible, and its exploration by levels is fairly under way. The main shoot down to the sixth level, a depth of 754 feet, has contained about 165,000 tons, with a smelter's gross assay value of $3,100,000 From the nature of the ground it is impossible to see ahead or to make any predictions as to the chances of success or failure."

J. P. Graves, general manager of the Granby Con. M, S. & P. Co., says that the third furnace in the smelter of the company at Grand Forks has been blown in, and that 1100 tons of ore per day is being roduced. In about two weeks the fourth furnace should be in operation and then the daily quantity reduced will he 1500 tons. The converter is now treating matte from the Greenwood, Grand Forks, Nelson and Van Anda smeltors.

Shipments of ore from the Boundary mines for the week ending March 1 were: Granby Mines 5774 tons, Mother Lode 3338 tons, Snow Shoe 300 tons, Winnipeg 35 tons, Golden Crown 30 tons, total 9467 tons. The Greenwood smelter treated 1455 tons of ore and the Granby smelter 4753 tons, total 6208 tons for the woek.

The Canadian King Con. G. M. Co. has made its first shipment of twenty-three tons and the net smelter returns amounted to $641. The company's property is at Erie. The control has been bought by Cripple Creek, Colo., people, including J. M. Allen and associatos.

E. Baillie of the Idaho-Centennial mine, near Port Hill, states that twelve tons of ore are heing shipped a day. W. Roberts, Supt., has gone to Duluth, Minn., to confer with Eastern shareholders as to additions proposed to the plant.

The Sunset mine at Cody has paid dividend No. 5, amounting to $6000, making total dividonds to date $30,000. It is operated hy its owners, G. W. Hughes of Alamo, J Daly of Kaslo, F. J. Finucane of Greenwood and Mr. Cockshutt of Brandon, Man. G. W. Hughes is manager.

FORMOSA.

The Fujita-gumi Co. of Osaka, Japan, will construct a gold smelting station and refinery at the sea shore of Koshiryo, Formosa, at an estimated cost of 200,000 yen. This construction will be finished in six months. This plant will be able so smelt 300,000 kamme of ore and to produce 12 kamme of gold a month. This enterprise was started as a result of Dr. Tsuno's experiments on the hlue clay ore which proved that gold could be extracted from it successfully.

MEXICO.

The mines and smelter of the Omaha Grant Smelting Co. at Volardena, Durango, have heen sold to the American S. & R. Co. for $5,000,000.

The Cubanas Con. C. Co is developing a property in the Monteserrat mountains, about 25 miles south from La Cananea, Sonora. H. J. Corcoran of Stockton, Cal., is president and A. H. Markley of San Francisco is secretary.

In the Sahuaripa district of Sonora, J. R. Hooper has sold for $25,000, to an American company, the San Miguol mine, near Arevechi. The company buying will proceed immediately to develop it and will install machinery.

YUKON TERRITORY.

Complete confirmation of the reports of rich pay dirt on Frazier or Mush creek, near Dalton's Post and other streams in the new gold district back of Porcupine, Alaska, has heen brought to Skagway by M. Brown, who says that Frazier creek is nearly 30 miles long and runs through a slate country. He prospected rimrock on three creeks with good results, and stakod claims on each of them. So far 130 claims have been staked, and Brown says there is room for 1000 more. The ground is shallow and free from boulders, and pay is evenly divided.

According to the Gold Commissioner's interpretation of the Treadgold concession to Klondike claims, Bonanza, El Dorado, Hunker, Bear and Last Chance creeks, together with all their tributaries, are closed entirely, and everything to which a grant was not issued prior to January 1, 1902, clear from summit to summit, is turned over to Treadgold and his associates. They, if they so chooso, need not

spend a dollar in the development of their gift for two years, during which time the public domain which has been presented to them lies idle, for they are prohibited from working any of their claims until certain conditions have been previously fulfilled. Within three years' time they are required to put 2000 inches of water on Bonanza creek and expend not less than $250.000.

News from Fort Selkirk, stated to be responsible, reports a placer discovery being made on an unnamed tributary of the White river, over the divide, on the Dalton trail, between Selkirk and the Nordenskiold river, more than 100 miles from Dawson. It is said that the find consists of coarse gold that runs $25 to the pan. A thousand men are reported to have left Dawson by all manner of conveyances—bicycles, dogs, horses and on foot—for the locality of the strike.

Personal.

N. HALL is manager Abbey M. Co., at Abbey, N. M.

GEO. STARR, Supt. Empire mine, Grass Valley, is in San Francisco.

C. K. COLVIN of Denver, Colo., is sojourning in Los Angeles, Cal.

W. EVERETT, manager Leslie mine, at Wallace, Idaho, is in New York.

W. H. MERCER is Supt. Mercer Tunnel Co, operating near Clifton, Ariz.

M. R. DAY of Deadwood, S. D, is manager Lulu M. Co., at Hill City, S. D

JOHN DUNN, late of Cripple Creek, Colo., has located at Nogales, Ariz.

D. A. MCDONALD has returned to San Francisco from a visit to New York.

E. E. WANN has been appointed Supt. Champion mine, near Prescott, Ariz.

R. G. LEGG returns this week from Reno, Nev., to Salt Lake City, Utah.

T. B. COUNTRYMAN of Cripple Creek, Colo., is sojourning in Kingman, Ariz.

C. J. DAVIS is Supt. Lucania M. Co., which is operating at Placerville, Cal.

F. A. M. BURRELL of Chas. Schieren & Co, New York, is sojourning in California

H. M JARVIS, Supt. Bob Lewis No. 2 mine, Westville, Cal., is in San Francisco, Cal.

PERCY WILLIAMS, M. E., has returned from San Francisco to Salt Lake City, Utah.

P. E. HARROUN, C. E., late of Albuquerque, N. M., has removed to San Francisco, Cal.

T. E. SCHWARZ, M. E., Denver, Colo., accompanied by his wife, is visiting in California.

F. D. SMITH of the Chainman M. Co. at Ely, Nev., is in Mexico examining a mining proposition.

D. LOVE of Murray, Idaho, is Supt. Gold Standard M. Co, operating near Delta, Idaho.

W. SHARP, late Supt. Central quartz mine, at Damascus, Cal., is sojourning in Oroville, Cal.

T. ELLIOTT of Telluride, Colo., is at Tonopah, Nev., in the interest of some Colorado people.

J. M. BURKE of Boise, Idaho, was in San Andreas, Cal., last week, examining mines at that place.

E. H. MARTIN has been appointed metallurgical engineer of the Carnegie Steel Co., Pittsburg, Pa.

J. J. SAVELLS has been appointed foreman at the Capitol mine at Dale, San Bernardino county, Cal.

JULIAN SONNTAG of the Giant Powder Co. has returned to San Francisco from Novada county, Cal.

W. J. BELCHER, manager of the Fir Cap Con. M. Co. at Downieville, Cal., is in San Francisco, Cal.

A. KNUDZEN, manager Bob Lewis gravel mine, at Westville, Cal., is sojourning in Philadelphia, Pa.

WILLIAM T. ST. AUBURN, manager of the Niagara mine at French Gulch, Cal., is in San Francisco, Cal.

E. V. ORFORD, manager De Lamar mine, Silver City, Idaho, has returned there from San Francisco.

CHAS. F. FERRY, a California miner, now Supt. Candelaria, Mexico, mines, has returned to San Francisco.

CLARENCE K. COLVIN, M. E., has returned to Denver, Colo., from Sonora, Mexico, and points in Arizona.

E. O. KENNEDY is in charge of the smelter of the Calabasas Copper Co. in the Santa Ritas, near Nogales, Ariz.

J. A. FERGUSON, Supt. Red Point gravel mine, at Westville, Cal., was in San Francisco, Cal., early in the week.

J. B. HOBSON, Supt. Cariboo hydraulic mine, at Bullion, in the Cariboo district, B. C., is sojourning in Auburn, Cal.

D. P. ROHFING of Salt Lake City, Utah, has gone to Fay, Nev., to examine some gold-bearing properties for Eastern people.

W. ROBERTS, Supt. of the Idaho-Continental mine at Nolson, B. C., is in Duluth, Minn, the head office of the company.

J. R. ROBERTSON, M. E, of Philadelphia, Pa., is in Atlin, B. C., district examining quartz mines under development there.

H. Z. BROOK of Hancock, Mich., is manager Northwestern Dev. Syndicate, operating the Camborne group, near Nelson, B. C.

V. C. HEIKES of Salt Lake City, Utah, has been appointed chief clerk of the Department of Mines and Mining at the St. Louis World's Fair.

A STEWART, manager of the Silver King mine at Warren, Idaho, has returned there from a sojourn of some weeks in Eastern cities.

W. D. CURTIS, southern California representative of this journal, returned this week from San Francisco to his Los Angeles, Cal, headquarters.

T. L. WALL of Preston, S. D., and P. C. Waite of Bozeman, Mont, have been making an examination of a mining proposition near Philipsburg, Mont.

J. GORDON, formerly millman at the Empire mill at Plymouth, Cal., has accepted a similar position at one of the Hayward & Lane mines in Sonora, Mexico.

LEO VON ROSENBERG of New York returned on the 2d inst. from Mexico by steamship Curacao. Mr. Von Rosenberg examined mines in Sinaloa and Lower California.

G. MCLEAN has resigned as Supt. Detroit Copper Co. mines, in Morenci, Ariz., and M. H. McLean, his brother, the present assistant Supt., has been appointed his successor.

G. V. MITCHELL, assistant manager on the Cache Creek placer at Granite, Colo., for several years past, has resigned to accept a position with a mining company in South America.

J. D. YOUNG, mining engineer of Chicago, visited the galena, lead and zinc fields of Illinois, the past week. Mr. Young was there examining a lead mine for Chicago people.

H. TROMP, a mining engineer, is at Tonopah, Nev. He is sent out by the Government of the Dutch East Indies to study the mining methods in vogue in the great mines of the United States.

R. MCF. DOBLE of San Francisco, Cal., returned from Victoria, B. C., to San Francisco early in the week and left at once for Mexico, where he is to examine a large electric transmission proposition.

LAWRENCE TATUM, mining engineer of Chicago, representing Prof. J. D. Young of Chicago, will make a visit to New Mexico, where he will examine a gold quartz proposition for Chicago people.

W. A. KOUSNETZOFF, C. E. and M. E. of Vladivostock, Siberia, was in Oroville, Cal, last week. He is traveling at the instance of the Russian Government, which has sent him to California to visit gold mines and inspect the methods in use, and especially to study dredger mining.

Commercial Paragraphs.

THE Carstarphen Electric Co. has equipped a shop in Denver, Colo., to do electrical work.

THE S. H. Supply Co., Denver, Colo, have enlarged their quarters and increased their stock. The latter now includes electrical equipment.

A SULLIVAN MACHINERY CO. four-drill air compressor has been set up at the Denver, Colo, office of that company by Western Manager R. D. Hunter.

JEAN F. WEBB AND SON of the Pneumatic Cyanide Process Co., Denver, Colo., have sold a milling right to Judge Robert Doyle of Watseka, Ill., who will use the process in a mill to be erected in Mono county, California.

CARL BINDER, engineer and contractor at Chicago, Ill., has issued a fifty-page catalogue descriptive of Otto aerial wire rope tramways, which states that these tramways can be constructed with grades up to 1:1 with clear spars of 3000 feet and more, for hourly transport up to 150 tons. It is stated that more than 1300 lines have been built and are in present use. The catalogue is handsomely illustrated and contains much interesting matter.

THE American Engineering Works of 204 Dearborn St., Chicago, Ill., is organizing a new system of trade publication consisting of a series of 4x6¼ cards and booklets intended to cover all points of mine, mill and smelter supply. It is expected that the number of these cards will reach 2000, and arrangements will be made so that they can be kept for reference on a card catalogue system of convenience to purchasing agents of mining companies.

THE Denver Gas & Electric Co. have closed a contract with the Bullock Electric Mfg. Co. of Cincinnati, Ohio, for new machinery for their West Side, Denver, station, consisting of one 1500 kilowatt direct-connected three-phase alternator, one 600 kilowatt three-phase belted alternator and one 400 kilowatt belted direct-current power generator. These machines constitute the third order for large machinery placed with the Bullock Co. by the Denver Gas & Electric Co. within the past eight months. Last September the Bullock people sold the same company a 600 kilowatt three-phase alternator, and immediately after its installation its duplicate was purchased. This last order will complete one of the largest plants in the West. This business was transacted through the Bullock Electric Mfg. Co. office at 251 Coronado Bldg., Denver, Colo.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING FEBRUARY 25, 1902.

694,231 —SASH FASTENER—W. W. Batties, San Jose, Cal.
693,943.—FLYING MACHINE—W. J. Bell, Los Angeles, Cal.
693,944.—RAILWAY SWITCH—W. J. Bell, Los Angeles, Cal.
694,242.—WAVE MOTOR—W. Borchart, Carson City, Nev
693,827.—TRACE BUCKLE—S. Boyer, Colfax, Wash
694,247.—TREE SUPPORT—T P Brown, Riverside, Cal.
694,002 —MINING ELEVATOR—H. W. Davis, Auburn, Cal
694,005 —CONCENTRATOR—W. G. Dodd, S. F.
694,060 —CUTTER HEAD—C. E. Hawley, Berkeley, Cal.
694,274 —PROPELLER—B. T Heroid, Vallejo, Cal.
694,290.—AMALGAMATOR—M. Lasswe l, Spokane, Wash.
694,311.—PUSH BUTTON—Laughlin & Schuyler, Los Angeles, Cal.
694,063.—PIN FASTENER FOR SHOW CARDS—L. Lemos, S. F.
694,064.—SUSPENDER CLAMP—L Lemos, S. F.
694,103.—MANIFOLD BOOK—A Levison, S. F
694,212.—PRESERVING WOOD—I. B. Sprague, Everett, Wash.
693,988 —CAR TROLLEY—E. W. Taylor, Spokane, Wash.
694,219.—MAIL BOX—W. L. Vestal, San Bernardino, Cal.
694,042.—BREAD TOASTER—R. C. Vroom, San Diego, Cal.
693,938.—OIL BURNER—G. E. Witt, Fresno, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

CIGAR WRAPPING MACHINE.—No. 693 669. Feb. 18, 1992 J. J. Ryan, San Jose, Cal. This invention consists of a table or support having a central opening, bunch-supporting rollers in said opening, a slotted and slidable gauge plate above said rollers and in the plane of the surface of the table, said gauge adjustable for cigars of different lengths, a pivoted arm carrying a spring-pressed guide roller and movable in relation to the bunch-supporting rollers, so as to rest upon the bunch and hold it in position, a tip former carried by said arm and adjustable in relation to said gauge plate to the different lengths of cigars, a revolubic tucker, and means for operating the tucker and rollers in unison. This device can be operated with ease and rapidity, affording uniformity in results, and is adjustable for cigars of any desired form or length.

EXTENSION FOR CUTTER HEADS.—No. 694,060. Feb. 25, 1902. C. E. Hawley, Berkeley, Cal. This device relates to improvements in attachments for planing, grooving, matching and similarly actuated machines. It consists in the combination with a cutter-head of detachable blocks extending radially from said head so that a line substantially through the center of the blocks will intersect the axis of the head. Means are carried upon the blocks whereby the knife may be rigidly held and made to present its cutting edge in proper relation to the work. Plates or distance pieces are adapted to be interposed between the blocks and the head to increase the range of cut.

PIN FASTENER FOR SHOW CARDS.—No. 694,063. Feb. 25, 1902. L. Lemos, San Francisco, Cal. This invention is designed to attach show cards or price lists to goods and consists of a hook-shaped pin having a peculiarly constructed base and extended shank and a flexible fastener connected therewith. The pin has a transverse loop at its base and integral with it and a flattened extension at right angles with the loop with means for securing it rigidly to the card.

SUSPENDER AND GARMENT CLAMP.—No. 694 064. Feb. 25, 1902. L. Lemos, San Francisco Cal. This invention is designed to provide a device by which garments, such as trousers, may be supported from suspenders which pass over the shoulders of the wearer. It is the object of this invention to dispense with the use of buttons for making such connections. It consists of two parallel spaced plates pivotally united between their opposite ends; one of said plates having at one side a pivot connection, means for attaching the suspender, and a stop to limit the swinging movement of the other plate. Both of these plates have inwardly turned lower edges and portions between said edges and the pivotal connection corrugated in transverse lines, so that the edge of the goods may be firmly clamped between these corrugations and inturned ends by simply swinging the two plates so as to press the goods between them.

Latest Market Reports.

SAN FRANCISCO, March 6, 1902.

SILVER.—Per oz., Troy: London, 25 7/16d (standard ounce, 925 fine); New York, bar silver, 54¼c (1000 fine); San Francisco, 54¼c; Mexican dollars, 45¼c San Francisco, 43¼c New York.

COPPER.—New York: Lake, 1 to 3 casks, $12.50; carload lots, $12.12½; Electrolytic, 1 to 3 casks, $12 37½; carload lots, $12.00; Casting, 1 to 3 casks, $12 37½; carload lots, $12.00. San Francisco: $15 15. Mill copper plates, $18.15; bars, 24@18c. London: £55 17s 6d per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £11 13s 9d per ton = 2.43 cents per lb.

SPELTER. — New York, $4.10; St. Louis, $3.85; London, £17 per ton; San Francisco. ton lots, 5½c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

IRON.—Pittsburg, Bessemer pig, $17.00; gray forge, $15.75; San Francisco, bar, 2.60c per lh., 2.65c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $30.00; open hearth billets, $31.75; San Francisco, bar, 7c to 12c per lb.

TIN. — New York, pig, $25.50; San Francisco, ton lots, 26c; 1000 lbs., 25½c; 500 lbs., 25¼c; 200 lbs., 25¼c; less, 26c; bar tin, per lb, 30c.

PLATINUM.—San Francisco, crude, $17 per oz.; New York, $18 per Troy oz

QUICKSILVER. — New York, $51.00 large lots; London, £8 17s 6d; San Francisco, local, $48.00 per flask of 76½ lbs.; Export, $45.00

MAGNESIUM.—New York, $2.90 per lb.; San Francisco, $3.75.

BISMUTH.—New York, per lb., Subnitrate, $1.50; San Francisco, $2.50 to $2.75 per lots.

ZINC.—San Francisco, 5½c; slab, 5¾c; bar, 7c; zinc dust, N. Y., 6c.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 18c; San Francisco, Plumbers', 100-lb. lots, 14.14½c.

NICKEL.—New York, 50@60c per lb.

FERRO-MANGANESE. — Pittsburg, 80%, domestic, $53.50, large lots.

TUNGSTEN.—New York, per lb., 95c; San Francisco, $1.15.

FERRO-TUNGSTEN. — New York, 37%, 32c; San Francisco, 65c (60%).

ASSAY LITHARGE.—San Francisco, 10c per lb, small lots.

PHOSPHORUS. — F. o. h. New York 50@60c per lb.

POWDER.—F. o. b. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c per set; 14 oz., 40s., 9c.

OILS.—Linseed, pure, boiled, bbl., 76c; cs., 81c; raw, bbl., 74c; cs., 79c. Deodorized Stove Gasoline, bulk, 15c; do., cs., 21½c; 86° Gasoline, bulk, 21c; do., cs., 26c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 19½c; Lard Oil, Extra Winter Strained, bbl., 90c; cs., 95c; No. 1 bbl., 65c; cs., 70c. Neatsfoot Oil, coopers' bbls., 70c; cs., 75c; No. 1 bbl., 50@52½c; cs., 55@57½c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymho, $7.50; Pennsylvania, bd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $8.50; Colorado Anthracite, $14.00. Coke, $16 per ton in bulk; $18 in sacks.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 30@31c per lb.; carloads, 28@29c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66° B, 2c per lb.; soda ash, $1.90 per 100 lbs.; hyposulphite of soda, 2¾@3c per lb.; blue vitriol, 5¾@6¼c per lb.; horax, concentrated, 7@8c per lb.; chlorate of potash, 12@13c; roll sulphur, 6c; alum, $1.90@2.00; flour sulphur, French, 2½@2¾c; California refined, 1¾@2c; nitric acid, in carboys, 8c per lb.; caustic soda, in drums, 3@4c per lb.; Cal. s. soda, bbls., $1.25 @1.50 per 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins.

SITUATIONS WANTED.

MINING ENGINEER, with many years experience as manager and superintendent, is open for an engagement. Is at present engaged as superintendent of a large copper mine. Address Engineer, care Mining and Scientific Press.

MINING ENGINEER, practical miner and mill man, assayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best references. Now working in southern California. Address A. M. P., care of Mining and Scientific Press.

WANTED. — Position as superintendent of quartz mine. Worked as miner, engineer, mill man and superintendent. Superintendent at present. Would engage for foreign service. References given. Address Economy, this office.

WANTED.—POSITION AS MILL SUPERINtendent or Foreman. Understand concentration, amalgamation, cyaniding and assaying. Seventeen years' experience. Address "Mill Foreman," care of Mining and Scientific Press.

WANTED.—POSITION AS ASSAYER, SURveyor, or Assistant Superintendent by technical graduate; three years' experience in mines of California and Colorado. Address I. E. D., care of Mining and Scientific Press office.

WANTED.—Position as Assayer and Millman by a practical man. Am a practical miner. Understands cyanide work and mine accounting. Competent to act as assistant superintendent. Can handle men. No objection to Mexico or British Columbia. Address O. T., care of this office.

WANTED.—SITUATION AFTER MARCH 15, 1902, as Manager or Superintendent of mine. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work. Four years' experience as manager and superintendent. Treatment of low grade ores a specialty. Practical in every detail. State location of mine and salary. Best of references. Address X Y. Z., this office.

WANTED—A Second-Hand Concentrator in first-class order, delivered to railroad. Give description and cash price.

Address N. S. TROWBRIDGE. Columbia Mill, Scott River Post Office, Siskiyou Co., Cal.

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BY THE FLASK OR CARLOAD.

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IN LOTS TO SUIT.

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Ores and Sulphurets Bought and Shipped. Mining Supplies Furnished.

S. P. HOLDEN,

47 Merchants' Exchange, San Francisco, Cal.

The Fresno Scraper.

3½-4-5 Foot.

FRESNO AGRICULTURAL WORKS,

FRESNO, CALIFORNIA.

FOR SALE.

FOR SALE—80 Acres of Mining Land on Sqnaw Creek, in Backbone Mining District, Shasta Co., Cal. Quartz Claims on Land.

Address Room 28, No. 401 California Street, San Francisco, Cal.

FOR SALE—A well established assay office and laboratory doing an excellent business, located in an interior town and within a few hours of the Mother Lode mines. Must be sold by Mnr. 1. Best of reasons for selling. Address Wiest-Stradley Process Co., No. 39 N. American St., Stockton, Cal.

FOR SALE.

10,000 TONS TAILINGS FOR CYANIDE OR OTHER TREATMENT.

Address 621 Laugblin Building, Los Angeles, Cal.

FOR SALE.

ESTABLISHED CUSTOM ASSAY OFFICE.

Best opening and location in State. For particulars, address "Bornite," care of this office.

QUARTZ AND PLACER PROPERTIES in Siskiyou Co., Cal., for Sale.

Collections attended to. B. K. COLLIER, Attorney-at-Law, Etna Mills, Cal.

AMALGAMATING MACHINERY.

We have on hand at present a large amount of Amalgamating Machinery on which we can save you money and give you our guarantee as to their condition.

Send for Catalogue No. 37.

THE S. H. SUPPLY CO.,

22nd and Larimer Sts., DENVER, COLO.

FOR SALE.

QUICKSILVER MINE in California, near railroad; fully equipped; new furnace; plenty cheap fuel for years; now paying handsome profits; one of the best mines in the State. A snap if you get it soon. Call on or write

MINING BUREAU & REAL ESTATE CO.
189-190 Crocker Building, San Francisco.

FOR SALE.

The rich mine Mejia, situated within the free zone in the State of Sonora, Mexico, 15 miles from Nogales and 10 miles from the station Agua Zarca of the Sonora Railway. Good wagon roads to the mine; abundance of water, timber and pasture. The mine produces abundance of silver ore of high grade, good for export; 25,000 tons of extracted ore on the surface ready for the mill.

The mine in question is situated in a north and south ridge at an elevation of about 300 feet from a creek that flows east. The surface that it occupies is 75 acres. The title of the land is clear. The vein is 36 feet wide, coursing North 2.° East and dips 50% toward the East.

The country rocks are porphyry and granite, the gangue being lime carrying silver minerals.

The mine has been worked to a depth of 160 feet. The greater part of the workings are crosscut tunnels. There is no water in the workings nor is timbering needed in the workings. The ventilation is good. The ore that has been exported has produced an average of 150 ounces of silver and is free and easy to work. The price of the mine will be named after the property has been seen by the interested parties.

The mine will be sold at a very moderate price and under favorable terms. For further information apply to MESSRS LUIS A. MARTINEZ, Guaymas, Sonora, Mexico; FILOMENO LOAIZA, Hermosillo, Sonora, Mexico; ROY & TITCOMB, Nogales, A. T., U. S. A.

PORTER AIR LOCOMOTIVE

(STORED AT OUR CHICAGO SHOP)

FOR SALE.

USED 90 DAYS. IT IS NEW.

Cylinders 9x14. Gauge 36 in.

A Fine Opportunity for a Mine to Secure Engine Cheap.

IMMEDIATE DELIVERY.

Torbert & Peckham,

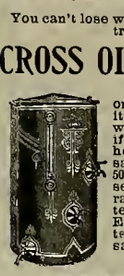
MONADNOCK BLDG.....CHICAGO, ILL.

THE CALIFORNIA DEBRIS COMMISSION, having received an application to mine by the hydraulic process from C. L. Canfield, in the Blue Tent Company Mine, near Nevada City, Nevada Co., to deposit tailings in a ravine below the mine, gives notice that a meeting will be held at Room 50, Flood Building, San Francisco, Cal., on March 10, 1902, at 1:30 P. M.

The Risk is all Ours.

You can't lose when you decide to try a

CROSS OIL FILTER.



We'll send you one on 30 days' trial. If it doesn't clean your waste oil perfectly; if you can't figure how it's going to save you at least 50% on your oil bills, send it back. We'd rather have the Filter than your money. Every Cross Oil Filter buyer must be a satisfied buyer. Write us about it.

THE BURT MFG. CO.,

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We also make the BURT EXHAUST HEAD.

ASSESSMENT NOTICES.

ROSS VALLEY LAND COMPANY.—Location of principal place of business, San Francisco, Cal.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 13th day of February, 1902 an assessment of seven dollars and fifty cents ($7 50) per share was levied upon the capital stock of the corporation, payable immediately to Charles P. Eells, the secretary of said corporation at room 211, in the Crocker building, at the corner of Post and Market streets, in the city and county of San Francisco, state of California.

Any stock upon which this assessment shall remain unpaid on the 20th day of March 1902 will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on the 5th day of April 1902, to pay the delinquent assessment, together with costs of advertising and expenses of sale.

CHARLES P. EELLS,
Secretary Ross Valley Land Company.

Room 211, Crocker building, San Francisco, California.

GARIBALDI MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Mariposa County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 5th day of February, 1902, an assessment (No. 2) of one and one-half cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, Room 15 Nevada Block, 309 Montgomery street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 15th day of March, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 7th day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

WILLIAM McPHERSON, Secretary.

Office—Room 15 Nevada Block, 309 Montgomery street, San Francisco, California.

SILVER KING MINING COMPANY.—LOCATION of principal place of business, San Francisco, California; location of works, Pioneer Mining District, Pinal County, Arizona Territory.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 31st day of January, 1902, an assessment (No. 23) of twenty-five (25) cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, No. 310 Pine street, Room 36, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 11th day of March, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on TUESDAY, the 8th day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

J. W. PEW, Secretary.

Office—No. 310 Pine street, Room 36, San Francisco, California.

TANANA MINING COMPANY.—Location of principal place of business, San Francisco, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 4th day of March, 1902, an assessment (No. 5) of ten cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Room 405, Claus Spreckels Building, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 7th day of April, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on TUESDAY, the 29th day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

EDWARD H. STEARNS, Secretary.

Office—405 Claus Spreckels Building, San Francisco, California.

EUREKA CONSOLIDATED DRIFT MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Placer County, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 25th day of February, 1902, an assessment (No. 34) of one-half (½) cent per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, Room 31, 214 Pine street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 31st day of March, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 21st day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

GEO. W. DIXON, Secretary.

Office—Room 31, 214 Pine street, San Francisco, California.

LITTLE STANDARD OIL COMPANY.—Location of principal place of business, San Francisco, California; location of works, McKittrick District, Kern County, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 4th day of March, 1902, an assessment (No. 3) of ten cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Room 40, Chronicle Building, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 12th day of April, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 12th day of May, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

R. L. CHENEY, Secretary.

Office—Room 40, Chronicle Building, San Francisco, California.

YUBA CONSOLIDATED GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Nevada County, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 19th day of February, 1902 an assessment (No. 6) of three cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Rooms 58-59, 214 Pine street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 24th day of March, 1902, will be delinquent and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 14th day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

JAMES B. BROOKS, Secretary.

Office—Rooms 58-59, 214 Pine street, San Francisco, California.

DELINQUENT SALE NOTICE.

CONSOLIDATED ST. GOTHARD GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Nevada County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 20) levied on the 1st day of February, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
Block, Samuel	350	500	25 00
Bauer, Teress	518	200	10 00
Koch, C. A.	116	100	5 00
Koch, C. A.	138	11	55
Koch, August	139	11	55
Koch, August	329	100	5 00
Raabe, Geo. A.	354	200	10 00

And in accordance with law, and an order of the Board of Directors, made on the 1st day of February, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, Rooms 113 and 114, Crocker Building, San Francisco, California, on MONDAY, the 24th day of March, 1902, at the hour of 2 o'clock P. M. of said day, to pay delinquent assessment thereon, together with cost of advertising and expense of sale.

B. N. SHOECRAFT, Secretary.

Office—Rooms 113 and 114, Crocker Building, San Francisco, California.

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And School of Practical Sciences.

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ELECTRICAL DEPARTMENT: Theory and Practice; Construction. Mechanical Drawing.

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Twenty-eight teachers; individual instruction; can enter at any time; **Catalogue and Journal free.**

CARL BINDER,

Engineer, Manufacturer and Contractor.

MAIN OFFICE: Schiller Bldg., 103 Randolph St.
WORKS: Ashland Ave. and Bloomingdale Road.

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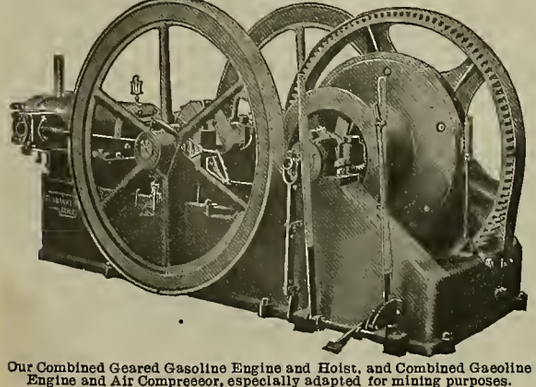
More than **1300 LINES** built in all parts of the world, of lengths of more than 20 miles and spans up to 4000 feet.

STRUCTURAL STEEL WORK

for mine, mill and smelter buildings a **Specialty.**

THE CALIFORNIA DEBRIS COMMISSION, having received applications to mine by the hydraulic process from J. M. Longnecker, in the Taylor Claim and Hull Claim Mines, near Genessee, Plumas Co., to deposit tailings in Indian Creek or a ravine tributary thereto; and from the Channel Found Gold Mining Co., in their mine near Lincoln, Placer Co., to deposit tailings in a dry swale below the mine, gives notice that a meeting will be held at Room 94, Flood Building, San Francisco, Cal., on March 24, 1902, at 1:30 P. M.



Our Combined Geared Gasoline Engine and Hoist, and Combined Gasoline Engine and Air Compressor, especially adapted for mining purposes.

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Mining Machinery and Supplies,

STEAM Engines, Hoists, Pumps, Boilers.

GASOLINE Engines, Hoists, Air Compressors, Pumping Plants.

Fairbanks' Standard Scales, Mining and Dump Cars, Patent Pressed Steel Wheels, Windmills, Tanks, Pipe, Valves, Etc.

FAIRBANKS, MORSE & COMPANY,

Chicago, Denver, San Francisco, St. Paul, Indianapolis, Detroit, Minneapolis, Louisville, Los Angeles, St. Louis, Cincinnati, Salt Lake City, Kansas City, Cleveland, Portland, Ore.

MINING AND SCIENTIFIC PRESS.

Whole No. 2173.—VOLUME LXXXIV. Number 11. SAN FRANCISCO, SATURDAY, MARCH 15, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

The Mine Unit.

Fashion as a business factor in mining enterprises has been frequently referred to in this journal. The mass of men who become miners through stock or partnership interests are very largely imitative in constructing their enterprises. Great individual successes, by which is meant the spectacular accumulation of individual fortunes in mines, bring would-be imitators of the success to investment in the locality of the mines, to the kind of metal mining in which the fortune was made, and even to the style of process employed in the mining. A development of imitative effort has made very large mines in the territorial sense a fashion at the present time. It is not at all uncommon to note mere dependence on bigness for success. It is sufficient with these optimistic people, to whom a million in a mine is a trifle, for them to find that the property submitted to their consideration is only a single twenty-acre claim. The profit possibility of the single claim is not a matter in point. It is only one claim. It is not big enough and is turned down to favor a weedy proposition with acres enough to make a stock farm.

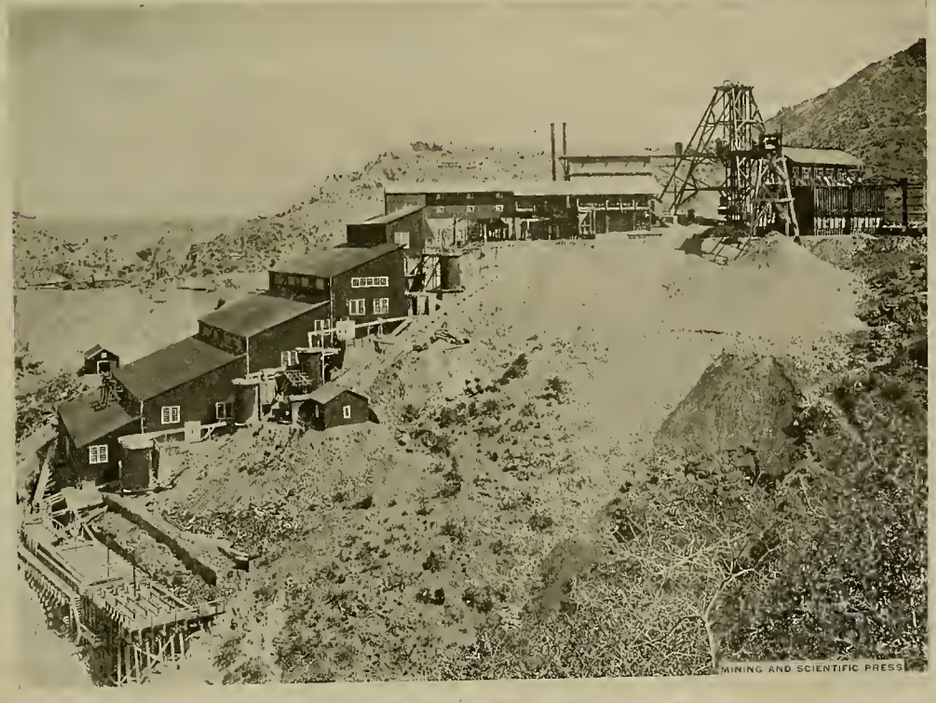
To the uninitiated the presumption is that a mining claim must be a mine, and possibilities of future profit are measured in the direct ratio of the number of claims and the surface acreage. The presumption is not, however, a fact—that is, not necessarily. A claim, of the numerous kind so much in evidence in the representations of the promoters who trail on the skirts of a real mine success, is apt to be nothing more than the promoter's imagination plus a lead pencil and a hatchet. It is quite safe to start with regarding it as having about the relation to the real successful mine that the blanks in a lottery drawing have to the capital prize.

Mere bigness as a dominating element in the success of a mining enterprise is not essential. Aggregations of mines under one ownership equalize profits and losses, and reduce administrative costs. They do not reduce mining costs and their tendency is to reduce the efficiency of the prospecting and development work. There is developed a tendency to depend on averages and avoid risks of loss involved in prospecting when, as the owners say, "We are doing well enough." Prospecting and development work in mines are most effective in proportion to the concentration of effort. If the management of each individual property is dependent on that property alone for success the effort is apt to be more effectively directed than when it scatters. Mining does not make in the ground what does not already exist, it merely finds it and appropriates it. The directory of a mining enterprise introduces the element of the same kind of business comparison that it knows in manufacturing, and is apt unconsciously to hold its mine management to the same kind of responsibility. The two things are not the same and the mining is limited in its chance of success by considering them the same.

It is not to be questioned that there are many common utilities in which one management and one plant giving a common service produces a great economy. It is not questioned but that the mine conditions may make in many cases the big operation the only possible economical operation. These two things can be conceded as demonstrated beyond the necessity of debate to support them. But it is questioned, if the real mining which is the base of the business can be most successfully built up into units which include many separate or separable units of single mines.

A little reflection will show that the successful big mining enterprises are not based on aggregations of many mines, or on big areas of single mine ownership. The unit of success that is big, is a small area, a single mine, operated intensively, and it may be added, having within it the raw material for an intensive activity. Chances of success in mines are not increased by scattering the underground part of mining. They are really diminished. Mines are found in the first place by men who prospect for them for themselves. Hired prospectors have no great record of successes for the people who hired them. Even small areas in a mining district must be gone over many times, and again many times, before the possibilities of mines can be considered exhausted. Men will do this for themselves, risking the loss of their own time, but capital will not do it and risk the loss of its money.

Morenci, Arizona, Showing Smelter of Detroit Copper Co.—(See Page 142.)



Concentrator of Detroit Copper Co., Morenci, Arizona.—(See Page 142.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 4 50

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

☞ MR. GEO. S. SCOTT is now our Chicago representative, office 737 Monadnock Bldg., Chicago, Ill., and is authorized to transact business on behalf of the MINING AND SCIENTIFIC PRESS.

San Francisco, March 15, 1902.

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THUNDER MOUNTAIN, IDAHO, DISTRICT is receiving a great deal of speculative attention at the present time. As a fact, however, very little is really known about it. Theories and claims of richness are the present substitute for actual facts. Many of the claims and some of the theories may later on be confirmed by the real facts as they will be disclosed by this summer's work of prospectors and miners. Among statements now made that should be taken with a good deal of reserve is the one that the entire mass of a rhyolite eruptive is gold bearing pay ore. Quite likely it contains the pay ore leads or chimneys, and these may be composed of the country rock itself without any physical difference in appearance to distinguish them from the barren country rock. It is absurd to claim more than this, and the statement would not require comment, except that it, and similar statements, may be the basis of fraudulent mining scheme promotions which react on legitimately based enterprises. There is no basis for the sale of mining stock on Thunder mountain propositions except the bedrock basis of a new district, in which one mine believed to have been made, is the presumptive evidence that there are others that can be made. Thunder Mountain district from the consensus of statements, more or less responsible, would seem to be a possible opportunity this summer for prospectors, miners, and the camp-following enterprises that are supported by them.

ON exactly what legal basis the assessment for taxation of mining claim locations is made by the county assessors, has never received a very lucid explanation. The land covered by the locations is public land of the United States, and, as such, it is not taxable in any State. The estate of the mining claim locator is not a fee, but a grant of that mineral portion of the soil which the miner can separate from the soil and make of it a chattel or personal property. The compliance with certain conditions vest the exclusive right in the locator to acquire this separable personal property. The act of location of the claim does not vest the title to the actual mineral property. No title to that can exist until it is separated from the soil and reduced to actual personal possession. Until it is so separated it is part of the public property. To restate more concisely: What the Government grants to the locator of a mining claim is an exclusive right to make personal property of part of the public estate. It does not grant a fee, nor does it transfer an ownership in personal property. What the States undertake to assess and tax is either or both of the two last-described things, which the Government does not give the locator nor does the locator possess. The real thing the locator has, and which the law has made grant to him of, namely, the right to make the personal property, is not assessed or taxed. Very slight consideration of what this is shows that it is only really taxable, if at all, as a license. After the locator has by the use of his right made personal property of any of the mineral in the land of his claim, that personal property is assessable and taxable. The tools, machinery and supplies a miner works with on his location are property which has an ascertainable value, and can therefore be assessed and taxed. It would seem that this matter of taxation of mining locations could be tested in the courts and won by the locators on the lines here suggested. It is a logical absurdity to assess what really is the present public property of the United States as if it were the property of one who actually only has a mere right of subsequent acquisition.

Gold Mining Tending to Lower Prices of the Other Metals.

It is but a comparatively short period of time since the terms gold mining, silver mining, copper mining, lead mining and zinc mining had definite meanings. Each was a branch of mining limited to fairly definite bounds. Metallurgical science had not then advanced to a point which took account of more than the principal metal in an ore. Then if one metal could be commercially obtained from an ore, the metallurgists were satisfied to merely eliminate the others. Exceedingly rich ores, carrying a mixture of the minerals of several metals, that could not be reduced by one or other of the practiced metallurgical methods for single metals, had to be thrown away.

The change of metallurgical science towards its present development has been constant, and latterly at a very rapid rate. It has largely broken down the old distinctions between the different kinds of mining. It can, indeed, be said that there are no longer any separable branches of metal mining, but only modifications of a standard practice. Ores are now mined for all of the metal in them. What was formerly wasted is now saved.

Gold mining which was formerly all either placer or quartz is now only largely these two. It has been extended in the commercial sense over what was formerly described as silver, copper, lead or zinc mining, and has been made inclusive of gold recovery from the complex ores which sometimes contain a little of everything. The commercial result of this is that as a result of mining for gold there is a large and constantly increasing production of silver, copper, lead and zinc as incidental products. Sometimes these operations are referred to as mining for one or the other of the other metals, but it will appear on consideration that the gold recovery was the real basis of the operation.

There is no competition in gold production. There is no market price to send up or down by supply and demand. The gold is itself the market measure. There is competition in the production of the other metals. There are always the elements of supply and demand affecting sale prices received by producers for these metals. With gold production, any of these other metals produced constitutes additions to the supply which do not come primarily to satisfy a demand for these metals. They would not be produced to supply a demand. Their sale on the market is largely unaffected by the cost of production. They are a by-product for which anything received is additional profit to the gold mining.

The aggregate of such non-competitive production is already large. Its proportion to total production is increasing. Take a single instance of a gold mining camp producing 2500 tons of ore daily, that contains only a dollar a ton more gold than will just pay all the costs of mining and metallurgical recovery, and with it 1.5% of recovered copper, that alone can not pay half of the costs. Obviously the camp could not exist dependent on copper production. Just as obviously it does exist on the gold production independent of the copper production. The latter has, however, to be produced to get the gold, and, produced, it is, of course, sold at its market price. But 1½% of copper from 2500 tons of ore is 75,000 pounds of copper daily and 22,500,000 of annual production, assuming 300 working days a year. This amount alone is a sufficient proportion of the total production to make a surplus which will depress prices. It is as well a production which agreements to restrict production will not restrict. The suppositious case here presented is practically the duplicate of an actual case, and of the kind it is only one of many, in which varying ratios of gold and copper contents, with or without silver, make commercial propositions based on the gold production.

The same condition exists with silver and lead; the former alone will make a commercial business on ores which contain large quantities of lead as a by-product. Such ores are mined and reduced for the silver. If the price of lead is high, so much the better. If it is low it reduces the profits, but does not wipe them out, and the mining and lead production go on just the same. Some of the silver-lead mines of British Columbia are producing lead simply because it is an unavoidable by-product of the silver production. It does not produce any profit to the miner, but it loads up the market and is bearing down the price of lead to the disadvantage of ores that can, if mined at all, only be mined for lead.

Zinc, with methods of saving it where it has heretofore always been wasted, is a by-product of some gold and silver production. It is simply a question of a little time when this kind of zinc production will aggregate a sufficient quantity to create a surplus of zinc production which will depress the price of zinc produced from what are solely zinc ores.

The tendency described as the effect primarily of the extension of gold mining is a real condition that can not be safely neglected in planning mining enterprises for the future. It will be found to be very largely the cause of the failures of the late efforts to permanently raise the selling prices of copper and lead. The copper price was broken down by a surplus of copper which was largely the production of gold mines. These gold mines are now an established condition of the copper mining industry, and must be taken into account in estimating the future profit of copper production.

THE definition of what constitutes ore in sight is receiving considerable discussion among engineers and mine operators. The personal equation has entered into its use rather more extensively than is compatible with the definiteness that an art that is to be ultimately an exact science should possess. Almost any one who has a mining claim that it is desired to sell writes for the promotion of the sale a descriptive paper which is by courtesy referred to as a mining report. The use of the term "ore in sight" in these literary documents is free and elastic. Any rock in place is ore in sight in many of these compositions. Others estimate it as being any of the mineral deposit exposed by a mine opening, quite regardless of its payable or non-payable quality, and quite regardless of whether of any ore body only one face is exposed, or three or four faces. Perhaps the closest limitation of the application of the term is to ore bodies which in the workings of a mine are exposed on not less than three sides, which only include the mass of ore which in place contains the pay mineral. The first use of the term is simply an evidence of ignorance of the meaning of the words by the user of them. The second use is a careless one. The close limitation of the third use overlooks the practical circumstances of mining, and can suggest misleading conclusions, though it is fully exact and correct in some circumstances. Broadened a little it will answer very well. Ore in sight should have a constant, unvarying meaning and should without explanation always describe the same definite thing. It is suggested that "ore in sight" should mean a body of rock in place, exposed by mine workings on not less than three sides, which, removable by the most economical mining methods applicable, shall contain of estimatable recoverable values at least the costs of obtaining them. This is sufficiently elastic to include as ore in sight the waste rock, not containing payable values, which in the most economical mining is unavoidably taken out and treated with the latter. It does not include such barren rock where the economical mining method separates it from payable rock before it receives metallurgical treatment. For example, a 4-inch wide streak of pay ore, if separable from the waste that must be mined out to get it, may be ore in sight. The same streak that cannot be separated from the waste may not be ore in sight.

Concentrates.

TIN or aluminum will dissolve in hydrochloric acid.

A MINER'S INCH should properly irrigate five acres.

THREE CENTS per barrel is the minimum cost of California crude oil production.

THE horse power of a boiler 66 inches diameter, 20 feet long, containing fifty-eight 4-inch tubes, is 98 H. P.

A 100-POUND FLYWHEEL, 15½ inches radius, 280 revolutions per minute, has a centrifugal force of 3451 pounds.

EXPERIMENTS extending through several years are opposed to the theory that wooden leaching vats absorb gold to any noticeable extent.

WITH illuminating gas costing 75 cents per 1000 cubic feet a 10 H. P. or 15 H. P. gas engine will cost to operate about 1¾ cents per H. P. hour.

WHERE a mining claim exceeds the statutory length it is not void, but the locator will be allowed to hold a claim 1500 feet long; the remainder will be rejected.

FREIGHT RATES on machinery such as gas or steam engines from Detroit, Mich., to Denver, Colo., are $2.30 per cwt.; to Santa Fe, N. M., $2.57; to San Francisco, Cal., or Seattle, Wash., $3.

A DIFFICULT but positive remedy for poisoning by water gas, which consists largely of carbon monoxide, is to place the victim in an atmosphere of oxygen at a pressure of thirty pounds per square inch.

THE energy of water flowing through a pipe that is used to overcome the frictional resistance to flow becomes heat. The iron of pipes and the water being both good conductors, the heat never causes a sensible rise in temperature.

A 1% GRADE is a rise of 1 foot vertically to 100 feet horizontally. A 1% grade gives, approximately, a resistance to traction of twenty pounds per ton. This rule is not absolutely correct, but for a 10% grade it comes within ½ of 1% of the truth.

THE oil pipe line of the Pacific Coast Oil Co. is 44 miles in length, a 2 and 3-inch pipe from Pico canyon to the sea at Ventura, Cal., delivering 600 barrels 41° oil every twenty-four hours, under a head of 1900 feet. The highest undulation is 200 feet.

USING COAL in a producer to make producer gas to operate a gas engine, a horse power hour can be produced for a pound of coal even with small engines. A horse power hour from a steam engine would require to produce it 2.2 pounds of the same coal.

IT is advisable, in shaping bits, to make as sharp a tool as the character of the rock will stand. Bevel the edge to a little sharper than 45° of angle. Make the bit square along the cutting edge, but leave a long taper of 60° of angle back to the body of the drill.

AN evaporation of 30 pounds of water from 100° F. into steam at 70 pounds pressure is equal to an evaporation of 34.488 pounds from and at 212° F., and an evaporation of 34½ pounds from and at 212° F. is equal to 30.10 pounds from 100° F. into steam at 70 pounds pressure.

THE diamond finds were made in the United States in 1901, in new localities. None of the finds has any anticipated commercial importance. The late discoveries of new fields that may become commercially important are in the Guianas and northern Brazil in South America.

FOR a 14-foot roadbed and 1½ to 1 slopes, the volume of a 20-foot fill for 100 feet is 3.259 cubic yards. For a 24-foot fill on the same basis there would be 4.444 yards—an increase of 26⅔%. A fill of 22.8 feet would have 4.070 cubic yards, and if it shrank 20% in volume, would equal a 20-foot fill.

IN electrical transmission of power as compared with belting or shafting the loss is proportional to the load, while with belting or shafting the loss is constant, and while it may be small in proportion to the total power at full load, yet being the same at a light load, it is a much higher percentage.

NATIVE ARSENIC is a gold precipitant. In a laboratory experiment, in which 15 gr. native arsenic were suspended in a weak solution of gold chloride, in 2½ hours the arsenic was yellow-coated, and in 12 hours two plates of gold were precipitated. The same result was obtained on passing a current of arseniuretted hydrogen through a solution of gold chloride.

ABOUT three-eighths of a gallon consumption of crude petroleum per stationary boiler horse power is a good result. A 150 H. P. boiler run ten hours daily would consume 412½ gallons, or ten barrels. A 75 H. P. boiler would consume half of this quantity, or five barrels in ten hours. Exact figures can not be given, as so many elements are indeterminate until the actual trial is made.

THE big fills in railroad work made by the Canadian Pacific Ry. Co. at Mountain creek embankment are by application of the early California hydraulic mining idea. Water is brought to a point 200 feet above the track and conducted in iron penstocks to where needed; from 5-inch nozzles a stream cuts the bank, the current carrying material in suspension through a flume to the point to be filled.

ELECTRIC street cars are propelled by electric motors attached to the car track, driving the axles by means of gearing. The current is taken from the trolley wire through the trolley wheel and conductor carried by the trolley pole, thence to the controller on the front platform, and from there to the motors under the car. The current returns to the generator at the power house through the rails.

THE cyanide process is not directly applicable to ores containing 2½% of copper, though the mineral form in which the copper occurs might modify the broad statement, accepting the claims of successes with some experimental work. If, however, the copper mineral can be sufficiently removed by concentration, the tailings from it may be possible of commercial treatment by the cyanide process.

ARCHÆAN GRANITE is a descriptive geological term used to describe the time relation of a granite to sedimentary rock formations adjacent. It would mean that the period of formation of the granite, its appearance as solid rock in place, was in the Archæan era, the earliest of the geological eras. It is also used to define a granite formed by the metamorphism of an Archæan sedimentary rock.

IN the case of the State vs. Baker, 61 Pac., 882, the Second Judicial District Court of Montana decided that a location of a mining claim properly made operates, even before patent, as a grant from the Government; and the estate acquired under it is a vested right to the fee, which becomes absolute upon the performance of the required conditions. It can be lost only by abandonment, or by forfeiture and relocation by another.

WHERE the locator of a mining claim allows his title to lapse by reason of non-performance of required annual assessment work, and the claim is legally relocated, all improvements made thereon, and upon the claim at the time the second locator has perfected his location, become the property of the second locator. The original locator has the right to remove any and all improvements before the claim has finally passed out of his possession.

THE mean effective pressure of an engine utilizing one-half a cylinder full of combustible mixture is about 60% that of the ordinary gas engine. The cylinder capacity of an engine maintaining a higher efficiency by greater expansion must be about twice the capacity of the ordinary gas engine cylinder for the same power developed. The same may be said of a steam engine utilizing the expansion of the steam compared to one without cut-off.

FURNACE flue dust is best treated by bricking and re-smelting. A bricking mixture may be made of fine flue dust and 10% lime, or 20% dust, 5% slacked lime and 75% siliceous ore. When the latter is free from sulphur, 3% fine coke may be added to furnish necessary fuel for burning in kilns. Bricks are from eight to ten pounds in weight and are dried in the air, or, better still, in dry chambers. They may also be burned in ordinary brick kilns.

THE Diesel motor has been illustrated and described herein at length. It is essentially a gasoline engine, adapted to use crude petroleum or other oils direct. It operates on the four-stroke or Otto cycle, but differs from other internal combustion motors in compressing a full charge of air to a point above the igniting point of the fuel, then injecting this fuel for a certain period into this red-hot air, where it burns with limits of pressure and temperature under control.

WHERE, in the 4 H. P. vertical style, the scale is $\frac{3}{16}$-inch thick on the tubes and part of the plates, get a boiler oil feeder, and, using kerosene oil, feed four drops per minute when the boiler is in operation, and until the scale begins to drop off, after that, two drops per minute. Should this occasion foaming reduce the rate of feed enough to avoid such foaming. The boiler must be frequently cleaned or else the scale dislodged by the oil will gather on the crown sheet and make more trouble.

THERE is a State Mining Bureau in California, supported by public taxation. It is the only institution of the kind in the State. The California State Miners' Association is on entirely different lines. It is a voluntary Association, supported by private contributions, and, while the two work in harmony, their formation, province and purpose are entirely distinct. E. H. Benjamin, 331 Pine St., San Francisco, is secretary of the California State Miners' Association, and L. E. Auhury, Ferry Bldg., San Francisco, is State mineralogist and chief executive officer of the Mining Bureau. Either can furnish complete data regarding the organization with which he is connected.

ACCORDING to the findings of the U. S. Court of Appeals in Stark vs. Geyser-Martin G. M. Co., a Utah case, the word "trustee" on a mining stock certificate has a specific meaning. It is a warning and declaration to every one who reads it (1) That the person so named is not the owner of the property to which it relates; (2) that he holds it for the use and benefit of another; (3) that he has no right or power to sell or dispose of it without the assent of the real owner. It signifies the opposite of the word "owner," and the term "trustee" is a term of administration and not of sale. The Court further held that the case was not affected by the fact that it is the custom among brokers to carry in their names as trustees the stock of third parties and to assign and transfer it without the consent of the third parties.

THE newest process of refining and mixing asphalt is as follows: A tank 10 feet by 10 feet by 15 feet high is filled with coils of 1¼-inch pipe not more than 6 inches apart. These coils are made of extra heavy pipe, well braced and protected, so that they will not be damaged by lumps of crude asphalt falling on them. In one of these tanks there are about 4500 linear feet of pipe, thus ensuring sufficient heating surface. The horse power required per tank is about 125, and the amount of water evaporated from each charge of asphalt is 28,000 pounds. To keep the mineral matter from settling, perforated steam pipes are placed in the bottom of the tank, from which the escaping steam keeps the mineral matter in suspension. At the temperature of refining the asphalt is liquid, and after all the water has escaped it is run into barrels and shipped.

LITTLE reliance is to be placed in any advertisement of mines or mining stocks in Eastern papers. This is a sweeping statement, but the facts justify it. What are considered "reliable" newspapers offer their editorial columns to indiscriminate "puffs" of any scheme, however swindling or worthless. Even the Boston Traveller—once considered a staid, steady, conservative journal—prostitutes itself that way. It offers to publish an editorial article endorsing any wildcat mining swindle that will give it an advertisement of 150 lines. To the credit of Western journalism, it is to be said that the papers in this west half of America are very few that would listen to such a proposition, much less make it and boldly proclaim the disgraceful fact. A leading New York City advertising agency announces its ability to get any kind of a "business" statement in the daily press under the head of telegraphic news, with a regular date head, just like bona fide news, for so much a line. Such procedure is a crime, but is daily practiced by those who know better.

THE pressure gauge employed on a steam boiler indicates the pressure on 1 square inch in the boiler in excess of or above the pressure of the atmosphere. The pressure in the boiler must balance the pressure of the atmosphere before the ordinary boiler gauge will indicate any pressure. This may be proved by attaching a vacuum and pressure gauge to a suitable vessel in which a vacuum may be created. As long as a vacuum exists it will be indicated by the vacuum gauge, showing that the pressure within the vessel is less than that of the atmosphere. When the pressure rises the pointer on the vacuum gauge will approach zero, attaining this position when the pressure in the vessel equals that on the outside. The pointers on both gauges will now be at zero, but as soon as a further increase in pressure is had the pointer on the pressure gauge will be seen to move away from zero, thus indicating only the pressure in excess of that of the atmosphere. The absolute or total pressure in the vessel when the latter gauge indicates one pound will therefore be 14.7 + 1 = 15.7 pounds.

"HURDLE DIKES" consist of a row or rows of clumps of piles driven about 4 feet center to center, so spaced as to give about 1 per running foot of length of dike. Their penetration depends on the nature of bottom, depth of water, etc., but would usually be from 15 to 20 feet at least. They are arranged in clumps by staggering their heads, which are drawn together and strongly tied with wire rope. The head of dike is given a trail down stream to throw off the scour of the end eddy. At the shore end the tops of the piles are kept at about high flood level, and are given a slight slope towards the head. The dike should be protected on all sides by mattresses sunk on the bed of the river. The object of the dike is to divert the current of the river. Its action is to slow the current and cause deposit of silt below it. Being permeable, it is not so severely exposed as in a solid groyne and its action is certain. The strength of the hurdle—that is, number of rows of piles, etc.—should of course be made to fit the conditions of the site of the dike. On the convex side of a river, where only the stream end of the dike is much exposed, the shore end clumps require but little strength, while on a concave bank the whole of the hurdle should be designed to withstand a heavy discharge against it.

"AMORTIZATION" is putting aside a certain amount of the mine's surplus earnings each year for the purpose of redeeming the capital when the mine is worked out. While many consider the idea a sound one, it is not put in practice much. In some European instances amortization goes beyond mere theory; but, in the United States, almost invariably the shareholders in a profitable mining corporation prefer to act for themselves, on the general principle that a man always feels more secure when the settlement of his financial affairs rests with himself, even though he may lose eventually. Where a company adopts the principle of amortization of its capital, the directors have to accept the responsibility of the safe investment of the funds set apart for that purpose—a responsibility which would be no light one, and which would increase in proportion to the value of the mine. Then, again, would come the question who should receive the benefit of such provision—in the majority of cases not those who provided the capital originally. Usually the original holders dispose of their shares long before the expiration of the life of the mine. The accretion in value, due to the fact that amortization of capital was being provided for, would rarely be fully reflected in the price of the shares; and, if it were not the original holders who sold their shares before liquidation, would not benefit to the extent to which they would be entitled. Right here is apparent the difference between a mining and a manufacturing corporation, the former being limited solely to the working of an asset of a terminable nature, and whatever theories may be entertained, the rule will popularly continue of dividing, proportionately, among the shareholders the excess of current receipts over current expenses.

The Treatment of Clay Slimes by the Cyanide Process and Agitation.*

NUMBER V.—CONCLUDED.

By E. A. H. Tays and F. A. Schiertz.

Storage Tanks.—Two of the original sand tanks, 20 feet in diameter and 5 feet deep, were fitted up for storage tanks, from which the solution was run to the zinc boxes. These were in line, at the end of the line of tanks nearest the precipitating room, and connected on a line with the bottom by a 4-inch pipe. The settling box discharged through a 4-inch pipe into the farthest of these two tanks (No. 1), the pipe being carried straight down to the bottom and discharging horizontally towards the farther side. A 4.5-foot stand pipe, set in a loose elbow on the end of the 4-inch pipe connecting this No. 1 tank with its mate, No. 2, was arranged so that it could be lowered, when necessary, in order to drain No. 1.

In this way No. 1 became full before it discharged into No. 2. On the end of the pipe discharging into No. 2 was put a T, and a 2.5-inch stand pipe set in this reached above the top of No. 2. This brought the air to the surface without unduly stirring up the solution discharged into No. 2. In No. 2 were fitted at intervals three 2.5-inch rubber hose, 7 feet long, attached to a wooden float that kept the intake about 2 inches under the top of the solution, whatever its level. In this way the solution was run to the zinc boxes through 3-inch pipes. The bottoms of these tanks were about 8 feet above the floor of the precipitating room, and the constant head in the pipes to the boxes averaged about 8 feet. With this arrangement the solution ran to the zinc boxes comparatively clear, but not absolutely so, as it always was upon leaving the boxes. More or less fine slime was deposited on the zinc, which increased the amount of precipitates produced and gave these a reddish color after running through the filter press.

Zinc Boxes.—From the storage tanks the gold solution was run to and through the zinc boxes. The "first solution" charge was decanted at about 0.5% of KCy, and the "second," or "wash," at about 0.03%. These were both pumped into the same storage tanks, and contained, as mixed, between 3 and 4 grams of gold and from 5 to 6 grams of silver per metric ton (1000 liters), the average strength in KCy being between 0.03% and 0.05%.

We had a set of ten boxes and three barrels for holding the zinc. Of the boxes, seven were of sheet iron, one of wood, with five compartments each 12x16 inches and 19 inches deep, and two wooden boxes with four compartments, each 30 inches wide, 15 long and 15 deep.

The barrels were 2 feet in diameter and 2 feet deep to the screen bottom, and had 6 inches clear space between screen bottom and the bottom of the tank. These three barrels, constituting one apparatus, were filled with zinc shavings, about 6 cubic feet in each, or 18 cubic feet in the three.

The solution was delivered to the first of these barrels through a 1-inch pipe, directly in the center, running down to and discharging against the screen bottom, which was of 0.25-inch mesh. It then came up through the zinc and discharged through a 1.5-inch pipe near the top, that ran over to and down into barrel No. 2, delivering the solution in the center and against the screen bottom; then, rising through the zinc, discharged near the top through a 1.5-inch pipe into No 3, where the operation was repeated, the solution discharging through a 1.5-inch pipe from near the top into the trough leading to the sump tanks. These zinc barrels were set about 1 foot apart, each about 8 inches lower than the next preceding, and so connected that any one could be cut out and cleaned while the others continued working. From 1.4 to 1.7 ton of solution per hour was run through, giving, as a rule, almost perfect extraction. In fact, their work was just about as good as that done by the boxes.

Each of the large boxes held 15.6 cubic feet of zinc and passed about 1.1 ton of solution per hour. Each of the small boxes held 10.2 cubic feet of zinc, and passed about 0.8 ton of solution per hour. These small boxes gave us the best general results and can be recommended as a standard.

Every 4 h. 0.5 kilo (about one pound) of cyanide was put into the first compartment of each box. We considered that this was beneficial, as it tended to keep the zinc "sharp." The solution, after leaving the zinc boxes, was conveyed to the two large sump tanks under the floor, where it was made up into standard solution by the addition of the necessary cyanide, and this, as needed, was pumped up to the trough, to be mixed with the slimes for a new charge.

Whatever suspended matter the solution carried was precipitated in the zinc boxes. We never found it any detriment to good precipitation, except that it required clean-ups to be more frequent than would have been necessary with a filtered solution. The slimes left in the zinc boxes also augmented the volume of the material to be smelted and reduced somewhat its percentage of gold.

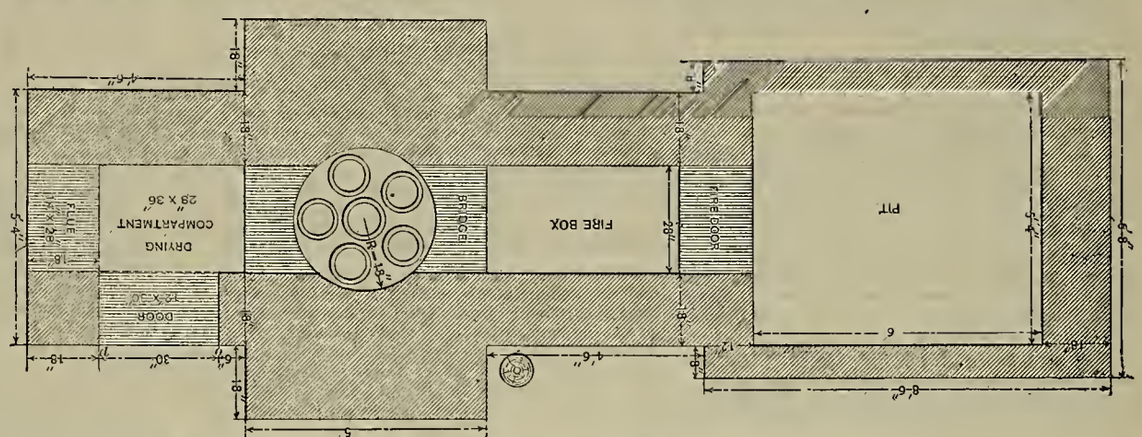


Fig. 5.—Plan of Furnace for Smelting Gold, Silver, Copper and Aurocyanides, With Wood as Fuel.

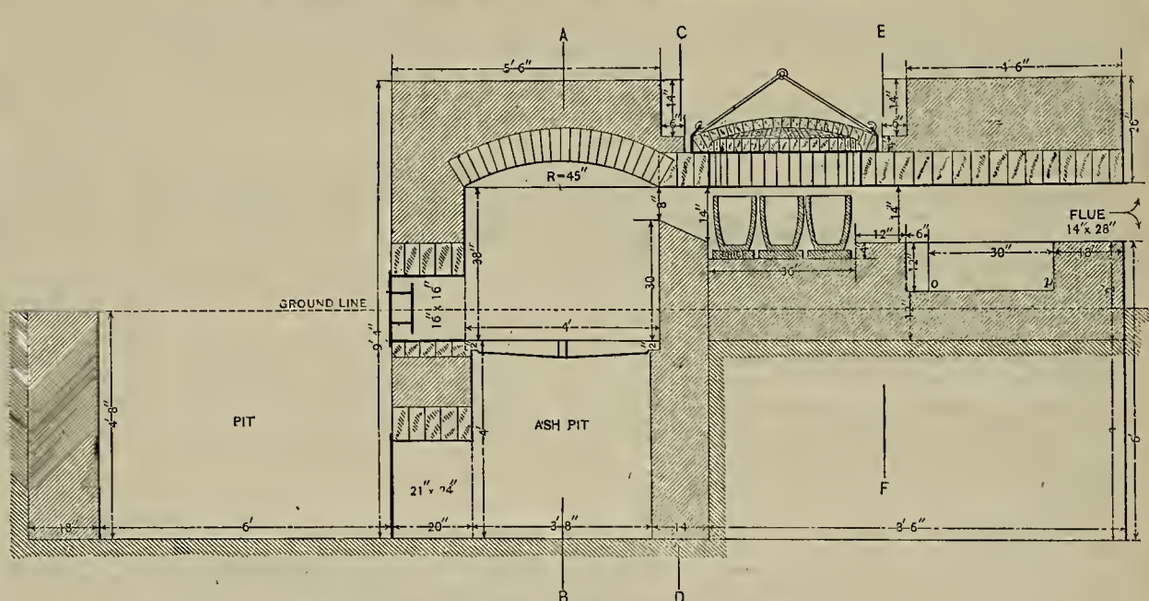


Fig. 6.—Smelting Furnace; Vertical Longitudinal Section Through Fig. 5.

Each box or barrel was cleaned in turn once a week, and toward the last the head compartment of each was cleaned out every four days and charged with fresh zinc.

We turned the zinc on the premises, making the shavings as wide as possible, but using even the fine dust, of which there was but little, care being taken to feed it with the coarser shavings as well intermixed as possible. The consumption of zinc for the whole run of eleven months averaged about 0.9 pound per ton of slimes treated. We discovered that good precipitation did not depend so much on the size as on the freshness of the zinc shavings. In fact, we now judge that the finer the shavings the better; but this point may be contested. That, in order to secure a perfect precipitation, the zinc used must be freshly turned, there can be little doubt. As already observed, the zinc was turned on the premises. After a while, there came to be nearly a month's supply of zinc shavings on hand. That used daily was naturally taken from the top, and, consequently, was nearly always freshly turned. Every precaution being taken to secure good results, the average precipitation for the first six months was over 95%. About the end of February the supply of zinc disks then on hand had been turned into shavings, and we began to use up the surplus pile. Within a week we had trouble with the zinc boxes, the precipitation going at times as low as 81%. Everything was done that could be thought of to remedy the evil, but it still continued. We noticed, however, that the box that was last charged with zinc did the worst work for that day. Towards the end of the month, judging from the irregular results from all the boxes, some good and some exceedingly bad, we decided that the trouble must be in the zinc. The turned zinc on hand lasted just through the month, and the average precipitation for that month (March) was only 93.59%; whereas, for the preceding month it had been 97.70%. The next month, starting on a new lot of zinc disks, we took care to turn only just fast enough, so as never to have on hand more than a day's supply of shavings in advance, and always to use of those on hand the first, and not the last, turned. From the outset the precipitation in the zinc boxes was all that could be desired, and the average precipitation for the month was 99.22%. Samples of the solution were taken from the heads and tails every hour, and for the assay samples 400 grams (about thirteen assay tons) of each were evaporated, with a little litharge, on an enclosed sand bed, heated by steam.

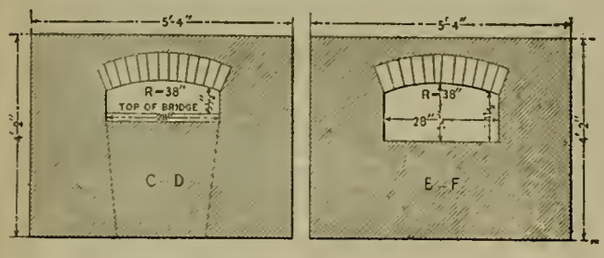
It would seem from this experience that, for perfect work in the zinc boxes, freshly turned zinc is a desideratum. After a few days' exposure of the zinc shavings to the atmosphere, an imperceptible film of oxide forms, and, although bright and fresh to the eye, offers resistance to the action of the solution. This is undoubtedly remedied by the use of lead acetate, recommended by some operators; this slight oxidation is, undoubtedly, the cause of the need of the acetate. We had no trouble in getting a precipitation of 98%, when using freshly turned zinc, from solutions running as low as 0.01% and 0.02% KCy and carrying some suspended matter in the shape of impalpable slimes. In cleaning out a box, all the zinc was washed on a 0.25-inch mesh screen over a 30-mesh screen, and all the zinc remaining on the coarse screen was returned to the boxes, new zinc being added to complete the charge. The fine zinc and slimes that went through the 30-mesh screen were run through the filter press and stored away, ready for smelting.

The coarser, which remained on the 30-mesh screen, was treated in specially prepared barrels with dilute sulphuric acid, washed, and also stored to await smelting.

Reduction of the Precipitates to Bullion.—The

*Trans. American Institute Mining Engineers, Mexican meeting, November, 1901.

product yielded hy the zinc hoxes was of rather low grade, very seldom assaying over 3.25% in gold and 4.50% in silver; hut it carried from 7% to 15% of copper. The fine zinc, before it was removed from the 30-mesh screen, was thoroughly washed and had the usual black color, whereas the pressed precipitates were red and at the first had the same muddy consistency as the material of the tailings dump.



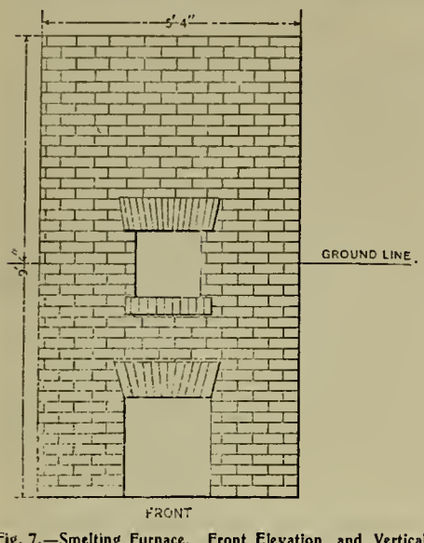


Fig. 7.—Smelting Furnace. Front Elevation and Vertical Sections Through C–D and E–F, Fig. 6.

Acid Treatment.—When we started the slimes treatment, precipitates and zinc were treated with dilute sulphuric acid in 2x3 foot wooden harrels, two parts of precipitates heing mixed with one part of zinc.

It was found, however, cheaper and more convenient to treat the zinc hy itself with dilute acid (two parts of water to one of concentrated acid). After ehullition had ceased, the harrels were filled with water and the material was washed for six days.

It was also noted that the use of hot water was more satisfactory than that of cold.

The following are two analyses of the material as smelted. Analysis I represents the mixture when precipitates and zinc were heing treated with acid. In No. II only the zinc had been treated with acid.

	I. Per Cent.	II. Per Cent.
Au	3.395	2.288
Ag	4.981	2.8955
Cu	6.955	12.15
Zn	16.148	20.15
Fe_2O_3	0.094	2.15
Al_2O_3	7.426	8.45
$CaSO_4$	28.32	26.86
SO_3	1.523	0.955

As has heen shown, these precipitates were rather too low in grade to he smelted on the premises, especially as there were no facilities for smelting on a large scale, and also in view of the large amount of flux needed. However, constant shortages—as high as 5% at times—in the returns from the smelting company, necessitated our shipping hullion, instead of precipitates, from the plant.

The furnace used for smelting was huilt on the principle of the hullion pot furnace, hut to hold six crucibles and to be fired with wood instead of charcoal, which was the available fuel for assaying and melting hars. Figs. 5 to 8 inclusive show the details of the construction of the furnace.

The firehox of the one we huilt was somewhat out of proportion to the rest of the furnace; hut, as old materials were used for the construction, it did not seem advisahle to spend much time in alterations. The front of the furnace was an old hoiler front that was lying around and the grate hars were the same as were used in one of the 60 H. P. boilers that ran the stamp mill. Notwithstanding the apparently excessive size of the firebox, the furnace did not use a large amount of wood and heated up rapidly and well. In melting copper all that was necessary was to carry a heavier fire, and it did not take very long to melt 60 kilos of copper in a No. 50 crucihle. In melting precipitates the average daily consumption of wood was 0.6 cord.

When melting was started, considerable trouhle was caused on account of the crucihles heing eaten through, sometimes not lasting more than one day, and it was noticed that just the top of the slag would have the corrosive action, eating a ring ahout 0.75-inch wide through the crucible. This top layer of slag was found to be white, with a disagreeahle taste, and a few qualitative tests showed it to be apparently a mixture of calcium and alkaline sulphates. The addition of some hematite iron ore, which happened to be on hand, was tried and improved matters considerahly, having a much more heneficial effect than the addition of pieces of scrap iron.

After long trials, the charge for smelting was finally fixed at the following mixture, in kilograms: 100 precipitates, 34 horax, 24 sodium hicarhonate, 5 sand, 6 clay, 3 ashes and 5 hematite.

The crucihles would he filled in the morning and refilled, as the previous charge melted down, until in the afternoon they were finally full. In this manner 120 kg. of precipitates would be melted in from ten to twelve hours, depending on the heat of the furnace.

The daily products were hullion, matte and rich slag.

Each crucihle yielded a disk of hullion weighing from 1 to 2 kg. When enough had accumulated, these disks were remelted and cast into hars, which assayed about .300 fine in gold and ahout .330 in silver, the halance heing made up of copper, iron and zinc.

The matte yielded hy each crucihle charge weighed ahout 2.5 kg. This matte was resmelted at the end of each month with an excess of scrap iron. Each crucihle, nearly full of molten matte, would yield from 15 to 20 kg. of bullion, in which, however, the silver was much in excess of the gold. No separate assay, however, was made, as this hullion was always mixed in with the other bullion. The final matte thus ohtained was rich in copper, iron and silver, hut carried very little gold. The matte ready for shipment assayed 20 grams of gold and 84,400 grams of silver per metric ton.

The slag ohtained from smelting was rich, running from $500 to $600 per metric ton. This slag, as it accumulated, was run over a lead hath in a Mexican vaso, which extracted hetween 92% and 95%. The waste slag from this vaso was not treated further, as the values were too low to warrant running it over again, although, hy such additional treatment, it could have been hrought down to $2 or $3 per metric ton.

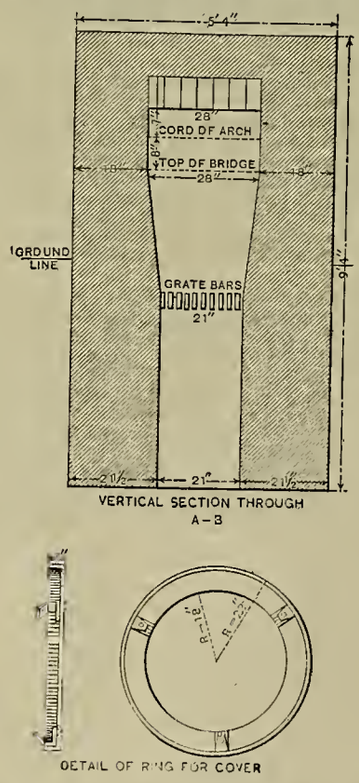


Fig. 8.—Details of Smelting Furnace. (See Figs. 5 and 6.)

Conclusion.—From what has heen written, it will he seen that we successfully treated a material that offered every incentive to let it alone, had it not been for the high gold values it contained.

A good idea of the physical character of the slimes was given hy our experience as to the effect of floods upon them. Before the first flood a rock falling anywhere on the surface of the dump would splash mud in all directions. A hog running at full speed jumped over the ridge at the upper edge one day and went out of sight, never to appear again.

Yet, while any weight would sink down through the jellylike mass, it was of such consistency that it would stand in hanks 8 feet high at an angle of 80°. When the first flood came, it went over the dam 4 feet deep and 50 feet wide, and in a few minutes carried away the earthy and rocky portions. This large volume of water rolled over the face of the slimes and in the two hours it lasted at full force did not cut it hack 10 feet.

The next morning there was an excavation at the foot of the dump cut, 6 feet deep and 20 feet across, down into the hed of the creek, in solid gravel, many of the houlders washed out weighing as much as fifty pounds. A rock thrown with ordinary force against the face of the dump would sink in at least a foot. A man standing out on it would have sunk through to the hottom. Out hack from the edge, where a stream was going over the face in a volume 10 feet wide and 1 foot deep, a rock alighting would splash mud and sink out of sight; yet the water could not cut the face hack 5 feet a day. At the next flood an immense volume rolled over the face to a depth of at least 4 feet, and, to all appearances, the face might as well have heen solid rock, the water seeming to make no impression on it whatever.

After over a month a steady stream and four floods had made hardly any further impression on the hody of the dump. The small constant stream seemed to have greater effect than a flood, for in a month's time it had gradually carried hack a cut some 8 feet wide, down to the creek hed, for ahout 200 feet.

The cost of treatment per ton was ahout $5 gold, divided as follows:

	Value.	Per Cent.
Cyanide, 7.31 pounds	$2 05	40
Zinc, 0.93 pounds	18	4
Administration and labor	99	20
Royalty	50	10
All other expenses: Materials, bullion, insurance, etc.	1 26	26
	$4 98	100

Under materials are included wood, acid and other supplies used in improvements and repairs. Of the last item, the hullion costs constituted ahout one-half, or 13%, of the total costs, made up of 8% for reduction expenses and 5% for freights, duties and commissions. Royalty was another heavy extra expense, heing 5% on the gross output.

Our total expense of $5 per ton compares very favorahly with the average cost of the treatment of the sands hy percolation, which was $7 per ton.

We helieve that, under like conditions, such as distance from the coast, the necessity of hringing in everything on mulehack, etc., no better can he done anywhere in Mexico. The only possihle further reduction in cost would he the consumption of cyanide, and that would depend wholly on the mineral and chemical character of the ore. We could have worked to hetter advantage had the plant heen huilt for the work, instead of heing an old plant altered and adapted, as far as possihle, to the new requirements.

The Detroit Copper Co. Concentrator at Morenci, Ariz.*

[STAFF CORRESPONDENCE.]

The Detroit Copper Co. concentrator, illustrated on the front page, handled 515 tons of ore per day during the month of Decemher, 1901. It is provided with crushers, screens, jigs, Chilean mills and various types of concentrating tahles. All this machinery is operated hy five gas engines of English make. The ores concentrated are sulphides, 75% of the product heing saved hy the jigs. By means of classifiers, settlers and tahles a specialty is made of the slimes. About 150 gallons of fresh water per minute are taken into the mill and ahout 1800 gallons are constantly in circulation. The system devised hy Supt. G. E. Hunt for settling the slimes, clarifying the water and pumping the latter hack to the head of the mill for redistrihution is one of the most interesting features of the work. Every gallon of the mill water, with the slimes it carries, passes through one of Mr. Hunt's automatic samplers on its way to the last settling tanks. Results, it is claimed, show the final tailings to contain ahout eight-tenths of 1% copper. The system of settling and clarifying is so perfect that the returning water is tolerahly clear. The mill operates in two sections, either one of which may run independently of the other. It is stated that this mill effects an 85% saving of the copper values, concentrating ahout seven tons to one ton.

At the smelting plant of the Detroit Co. there are five furnaces, which discharge direct to the converters. The furnace hlowers are run hy electric motors and they in turn hy two Westinghouse vertical gas engines. The converter hlast is supplied hy a steam-operated air compressor.

Morenci, Ariz., Jan. 21.

*See illustration on front page.

One of the newest patent applications for electricity is in making a more convenient faucet than that ordinarily used. Two pairs of electro-magnets are suspended from the walls, each pair heing mounted in such a way as to drive a piston up or down, according to which hutton is pressed. In this manner the piston opens or closes either the hot or cold valves and allows the water to flow into the howl.

The Auditing of a Mining Company's Accounts.*

By CHARLES V. JENKINS.

The comprehensive audit of the accounts of a mining company is extremely important in its relations to the legal situation and obligations of the corporation, the personal liability of the directors, and the interests of the investing public. A consideration of the subject as affecting the professional duties and fixing the responsibility of a mining engineer engaged in the expert examination of a mine, or in charge of mining operations, is equally important, though this phase of the question is not often presented systematically.

Business customs have pretty clearly established the purposes and principles of an audit. But in the absence of statutes compelling strict periodic investigation of their financial affairs, many companies of excellent repute do not avail themselves of the advantages afforded by such an audit. On the other hand, the failure of many companies to make public the true state of their affairs by means of an adequate financial audit is the frequent cause of loss to investors. The value to both parties of a systematic and thorough examination of company accounts is becoming, however, more and more generally appreciated; and it is to be hoped that this may result in suitable legislation, requiring an annual audit of the accounts and financial affairs of all private corporations, and providing for the license and registration of competent, professional accountants. Such a rule would tend to eliminate that element of fraud and the consequent danger of loss to which the stockholder is exposed, when he is forced to rely upon officials for information relative to the standing of the company in which he is interested. True, a financial audit offers no protection against the false or erroneous statements of the condition of the mine itself. Nor will it assist stockholders in penetrating the mysterious reticence or paradoxical ambiguity with which boards of directors muzzle and muffle their reports regarding the present condition and future prospects of their mines—a policy of concealment and of mystification which operates, as positively as tangible fraud, to enhance the element of speculation present, in varying degree, in all mining enterprises.

But it is safe to say that in a mining venture, where risk is always expected, capital will more readily seek investment, and stockholders will more cheerfully assume risk and more willingly assume any reasonable policy of a board of directors, if good faith and frankness are shown by regular and comprehensive reports and audits.

THE VALUE OF AN AUDIT.—The value of a commercial or general business audit depends upon its purpose, its minuteness of detail, the authority and responsibility of the auditor, and the scope of his instructions. The duties of an English chartered accountant, acting as an auditor, are defined, and, to a certain extent, specified by the "Companies Act" of 1862, which compels an annual audit of all registered joint stock companies. The United States law has a similar provision, compelling the examination of all national banks by qualified government examiners. But so far as other corporations of private enterprise are concerned, an auditor's duty consists in performing that for which he is employed, and he is responsible to his employer only. If his appointment depends upon the good will of the company's officials, the presumption is that he will act as their agent rather than as the agent of the stockholders; or, if he be engaged to examine accounts and report upon some particular question, it is not likely that he will take it upon himself to extend his examination and report to cover more than that question. For instance, if he is asked to ascertain whether a reported reserve fund is real, or exists upon paper only, and how the said fund is invested, or to say whether, in his opinion, the working capital is sufficient, he would discharge his duty by a partial examination of the accounts and a report upon the one question submitted to him. But when a complete audit of the accounts of a mining company is required for the purpose of presenting to the stockholders a statement exhibiting the financial position of the company, and furnishing data which may possibly assist in deciding upon future operations, the auditor, if employed as the agent of the stockholders, will exhaustively examine and check all books of account and all the financial affairs of the company.

INSPECTION OF ACCOUNTS BY MINING ENGINEERS.—In examining a mining property for clients who contemplate purchase, the mining engineer often finds it necessary to make an exhaustive search through the accounts and records previously kept by the owners of the mine. This is, perhaps, most frequently the case when it is desired to ascertain the actual cost of mining at a producing mine. If such a mine has been operating sufficiently long to have established a fairly uniform cost, he may be warranted in accepting the figures given by the owners, supplemented by only a cursory inspection of the accounts. But in case of doubt or suspicion it may be desirable to verify the figures given. While some mining companies, in calculating the cost per ton of the ore extracted, include all expenses of dead work, development, exploration, etc., many others state as the cost of extraction work the actual expenditure for stoping and hoisting only, treating the development work, especially in shaft sinking, as a "capital" expenditure. Practice in classifying expenditures in this respect, and the arrangement of accounts relative to mine costs, is so varied that an engineer can satisfy himself only by an examination of the books, if he would know what items are included in the costs. Particularly in considering a "low grade" proposition, where accurate data are absolutely necessary, it is an immense advantage to be able to determine in detail, by personal investigation, the actual facts.

Of course, the present worth of a mine cannot be determined by the amount of its past dividends; yet, in many instances, the gross earnings, as represented by the tonnage and value of ore already produced, may have a signal importance in considering the future relation of profits to operating expenses.

The value of the product of the various stopes, as shown by the record of ore sales, affords the closest possible check upon the values obtained by sampling the several ore bodies from which ore has been shipped. A determination of the tonnage and value of "ore in sight" is naturally the first consideration of the engineer. But in his judgment of the mine as an investment, the item of costs is a factor of equal importance. From no other source can he obtain such accurate detailed information relative to the costs and charges of mining as from the books and past records of the mine under examination.

THE CONDUCT OF AN AUDIT.—Since the mining business is so radically subject to local conditions, it is to be expected that the forms of records and accounts will be varied to suit each special case. And, although the principles of accounting are fixed, there exists almost as great a diversity in the system of accounts in use as in the forms and registers employed. With due appreciation of the difficulties likely to arise from this lack of uniformity, the following general suggestions are offered as to the manner of conducting a practical audit of mining accounts.

In the majority of instances, a mine is owned and operated by a corporation, the main or financial office of which is far from the mine. This makes it practically necessary to consider two sets of accounts: Those conducted at the mine, which directly concern the mine management; and those belonging to the province of the secretary, which constitute the permanent financial records of the company. The mine office accounts, in full detail, together with vouchers, are usually forwarded at regular intervals to the main office, where a general audit is made, there being at the mine office but a local audit or checking of the accounts. For the present purpose, however, it may be assumed that all the records are kept and all the accounts conducted in the office at the mine.

LIST OF BOOKS.—In order to plan an intelligent dissection of the accounts, it is necessary to know how they are put together. To this end it will be well, first, to secure from the person in charge an explanation of the system employed, with a list and description of the books used. Indispensable, of course, to the double-entry set of books usually kept at a mine, are the cash book, journal and general ledger. In addition to these, and to the several subordinate record books, blotters, etc., which convenience demands, a well regulated system of mine accounts ought to include books of ore shipments and of mining costs. The former should show in detail the lots of ore sold at the mine or shipped, identifying each lot by number, and giving date of shipment, weights, terms of settlement, values, and net returns, and also specifying the stope or heading in the mine from which the lot was mined. The costs book, in the nature of an independent or special ledger, is kept to relieve the general ledger of the burden of the many accounts necessary when accurate record is made of the costs chargeable to each separate place of working in the mine. Cost keeping is one of the most important departments of mine accounting; and the costs book, when properly conducted, is a regular monthly statement and analysis of costs, itemizing the cost of labor, material and supplies, and distributing the power and operating charges, and the indirect or fixed and general expenses. Moreover, it is also a special ledger, containing an account with each place of working, in which are charged monthly the itemized costs as above, and from which are carried, by journal entry, the totals only of the month's expenses to a "Costs of Mining" account in the general ledger.

The general ledger is considered the principal book, being the source from which is obtained all classified information relative to the financial condition of the business. But it may be well to suggest that, although this book is the receptacle for all transactions, in whatever book the entries may originate, the ledger itself is generally ignored by courts of law. The "book of original entry," legally defined as that in which the preliminary record or entry of a transaction is first written, is accepted as authority on all questions involved in a transaction or in a series of transactions.

CAPITAL STOCK; TREASURY STOCK; WORKING CAPITAL.—The capital stock comprises the full amount of the capital authorized to be raised by the charter or articles of incorporation. The treasury stock is the stock, over and above the amount subscribed and paid for when the company is organized, which is set aside and held by the treasurer, to be sold for the purpose of securing funds to carry on operations. If the entire capital stock was subscribed and the whole amount paid in was absorbed in the purchase of the mine and the necessary equipment, and further capital is needed to carry on work, the stockholders may, by agreement among themselves, instead of increasing the capital stock, donate pro rata a certain number of shares to be held and sold by the treasurer for working capital. A working capital account is sometimes opened with a credit of a certain amount of the subscribed stock or capital, this sum being set apart for use in prosecuting the development of the mine, etc. These accounts should probably receive first attention. An examination of all entries should be made from their origin in the auxiliary books to their final posting in the general ledger. The principal books auxiliary to the general account books of a corporation are the subscription book, installment book, transfer book and stock ledger. The stock ledger is used solely for carrying accounts with stockholders of their respective holdings in the company. All the other books mentioned are books of original entry, subsidiary to the stock ledger. Examination of these books should establish the fact that the capital stock account in the general ledger is credited with the full amount of the authorized capital, whether paid up or not. If it has not been fully paid, an open subscription account will probably be found in the ledger, exhibiting the amount of stock subscribed and not paid for. The amount issued and paid in should correspond with the aggregate holdings as shown on the stock ledger. A close scrutiny of the treasury stock account, or working capital account, if either exist, should be made, to ascertain the character of the account, and how it was created. If there is treasury stock on hand, carried as an asset, the amount should be noted.

CASH RECEIPTS.—A complete audit involves a careful and systematic checking of each and every individual transaction during the period under audit. The opening and subsequent entries covering cash receipts for capital stock subscriptions paid, and for treasury stock sold, should be examined and checked. The records of sales of treasury stock should be critically examined and the entries traced to their final exhibit on the books. If stock is sold at par, "Cash" will, of course, show the proper debit entry for the amount received. If disposed of at less than par, or if sold at a premium, the entries covering the balance or difference between the amount received and the nominal or par value of the stock, as well as the cash entry, should be carefully investigated. Strictly speaking, the discount on stock sold at less than par is not a loss, nor is the premium on stock sold above par a gain, of the business proper; and the amount in either case will probably be covered into the working capital rather than the profit-and-loss account. Frequently, however, especially if a profit has been realized on such sale, the amount is carried directly into Profit and Loss. Practice varies considerably in the conduct of accounts relating to treasury stock and working capital. But in whatever manner transactions of this nature are recorded, an audit will prove its efficiency if it determines that fictitious values are not given in the accounts representing resources, actual liabilities, expenses, or any other account affecting profit and loss.

Practically, the only revenue of a mine is derived from the sale of its product, in whatever form (crude ore, concentrates, matte, bullion, etc.) it may be marketed. All items of cash, as shown on the cash book, should be checked; but this one principal item should be verified by comparing the receipts, as entered, with the ore shipment register, and with the settlement sheets or statements rendered by the smelter or other purchaser. Such a statement is rendered for each shipment separately by all ore purchasers, or, in the case of a company smelting the ores from its own mine to crude bullion or matte, by the refinery to which this product is sold.

CASH DISBURSEMENTS.—All items of cash disbursement should be checked and compared with the vouchers or proofs of payment.

If the "voucher system" is employed, and transactions are recorded by classification in a voucher journal, from which the totals of like debits and credits, instead of individual items, are posted, the work of checking and comparing the itemized expenditures will be confined to this book of first entry. The footings of this journal are then verified, and the posting of aggregate totals is regularly checked.

A critical examination of the vouchers should be made to ascertain whether the payments were properly authorized and certified.

Pay rolls should be examined to see that they are properly and duly signed by employes, and that the totals of each are correctly entered.

The balance of cash shown by the books should agree with the amount of cash on hand and in bank,

*Trans. American Institute of Mining Engineers, New York meeting, February, 1902.

less the amount of outstanding cbecks not yet presented for payment.

After the purely mechanical checking of all entries in and postings from tbe cash book, journal, etc., and the verification of their arithmetical accuracy, the next, and essentially tbe most important, stcp is to trace eacb entry from its inception to its final posting, with tbe view of detecting errors and irregularities, whether of ignorance or of intentional fraud.

This critical examination is of considerable moment, particularly if tbe audit is made under conditions exacting a close discrimination between expenditures of capital and of revenue.

(TO BE CONTINUED.)

Gas and Gasoline Engine Ignition.

By ALBERT STRITMATTER.

Premature ignition in engines may occur from the incandescence of a small nut or sharp corner in tbe cylinder, or sometbing of that kind. Witb bot tubes tbe point of ignition varies according to the atmospheric pressure, and therefore if tbe ignition takes place at a proper point to-day, it may not do so tomorrow. Furtber than this, an engine with a tube igniter may be igniting at the proper point at the factory when it is tested, but the point at which it is used may be of much higher or lower altitude and tbus cause the ignition to occur early or late owing to the different atmospberic pressure. With electric igniters premature ignition may occur from some part getting out of adjustment, or from wear on some piece.

Premature ignition, however, must not be confused witb the "lead" of the ignition. By tbis is meant what was referred to before in regard to tbe ignition taking place before the crank bas reached tbe dead center. This lead must be allowed in order to give the mechanism a chance to operate and the cbarge time to be thoroughly ignited by tbe time the crank reaches the dead center.

On tbe other hand, late ignition, while not so disastrous to the engine itself as premature ignition, is just as effective in reducing the power of the engine. The power developed by any engine depends on the compression at the instant of explosion. If the piston reaches the farthest point on tbe compression stroke and starts out on the expansion stroke before ignition takes place, the compression decreases, resulting in an equivalent decrease in power.

As a matter of fact, tbe majority of troubles with gas engine igniters are due to lack of attention, just as is tbe case with troubles with other parts of tbe engine. Of course, the more delicate the igniter is the more attention it needs. An illustration of tbis came to my attention lately. In a large dry goods store there are located two engines used for operating elevators. I had heard for some time tbat the engines were giving considerable trouble and were shut down most of the time, and that unless they soon gave different results they were likely to be tbrown back on the manufacturer's hands. Some time ago, however, the owner of the engines employed as an engineer a man who had worked some in a gas engine factory. While be had not been employed as a machinist, he had considerable knack in picking up information, and when he took charge of the engine, which was of a different make than that made in the factory where he had previously been employed, he began to study the igniter very carefully. He soon found that unless a certain adjustment was attended to carefully the engine failed to ignite. As soon as he found out what the trouble was be studied to see how tbe adjustment should be made. Since he discovered this the engines have given no trouble and have never shut down once except when he has stopped them. Here was a case such as every gas engine manufacturer meets with frequently. Two engines of a good make were giving trouble of the worst kind, and simply because the operator did not understand an adjustment tbat had to be looked after. A new engineer is placed in charge and different results are secured at once, solely because he studied the engine and located the trouble instead of tinkering with this or that part in an aimless sort of a way. Take many a gas engine operator and watch him try to start his enginc. If he fails, ask him why it did not start. Probably he will look at you with a blank expression and then say he doesn't know. What kind of success is he going to have? It is, or should he, his business to try at least to learn why an engine does not give successful results, if it does not, and then do what he can to remedy the troubles.

Tbis applies to the igniting mechanism as much as to any other part of an engine. The man who has trouble and simply sits around saying he doesn't know why the engine doesn't run, or waiting for a man to come from the factory, is sure to have trouble all the time. If he were in charge of a steam engine and boiler he would soon bave an explosion, but having charge of a machine which Providence and the designer have wisely so made as to take care of bim (instead of his taking care of it), the engine simply shuts down and the operator "doesn't know why."—American Manufacturer.

Our Chicago Manager.

Mr. George S. Scott of Cbicago is the latest business acquisition of the MINING AND SCIENTIFIC PRESS. Up to Feb. 1st, 1902, he was Chicago manager of a New York mining journal, baving acted in that capacity for tbat publication for twelve years. Mr. Scott is well and widely known, and his pleasing personality, no less tban bis intimate personal knowledge and experience, gives him pleasant acquaintance of mutual value to a multitude of business men in the section he represents.

Mr. Scott has had about fifteen years practical experience with those engaged in the mining industry —tbe manufacturers of mining machinery, etc.—and bis advice and assistance are of recognized value. He

Mr. Geo. S. Scott, Chicago Manager Mining and Scientific Press.

has handsomely fitted offices in the Monadnock Blk., Chicago, where he will he pleased to meet and welcome tbe many friends and acquaintances of the paper. Mining men are cordially invited, wben visiting Cbicago, to visit the MINING AND SCIENTIFIC PRESS headquarters, at 737 Monadnock Blk. They can have tbeir mail sent to that address.

It is worthy of note that Mr. Scott, as representative of the MINING AND SCIENTIFIC PRESS, has an unusually fine mineral collection on view in bis office. This collection, owned by our Chicago manager, comprises over 3000 specimens, among which are sixty lead minerals, making the finest collection of lead minerals in Chicago. As a matter of fact, the great Field Museum has not anything to compete with it. It has cost him about $2500. Visitors to our Chicago office will have opportunity to see one of the finest mineral collections in the country.

Mr. Scott was born in New York City thirty-six years ago. The accompanying illustration will be recognized hy many as a portrait of one of the brightest and hest liked business men of the middle West.

Quicksilver Deposits in Texas.

In the southwestern part of Brewster county and about 12 miles from the Rio Grande there are deposits of quicksilver ores, chiefly cinnahar. From east to west the district is about 8 miles in length and 3 miles from north to south, the center being in the vicinity of Terlingua postoffice.

The cinnabar is contained both in the hard Cretaceous limestone and in the more or less decomposed bluish shale that occurs in the region. Towards tbe eastern part of the district the ore is more closely associated with the shale than with the limestone, althougb even here calcite is ahundant. The shale-like streaks that are found through the unaltered limestone may bave arisen through decomposition of the limestone along planes of deposition, for it is often to be ohserved that the rich stringers of cinnahar follow these planes and occupy cracks in the limestone filled with shaly matter. Very rich pockets of cinnahar are found in the district, and but little of the mining is carried on underground. By far the greater part of the ore is taken from open cuts, and the practice is to follow the indications wherever they lead.

The development of the district is proceeding as rapidly as possihle under the circumstances. The distance from the Southern Pacific Railway at Alpine is ahout 90 miles, from Marathon 85 miles and from Marfa about 100 miles, most of the freight and hauling going over the road from Marfa. In 1900 tbe production was 1750 flasks of quicksilver, and in 1901 ahout 3400 flasks, a flask holding about seventy-six pounds of the metal.

Practically all of tbe output to tbe end of 1901 is to he credited to the Marfa & Mariposa M. Co. Parker & McKinney produced some metal in a small furnace on tbeir claims near the eastern houndary of the district. The Marfa & Mariposa M. Co. has been operating a ten-ton furnace, and is now huilding a second ten-ton furnace alongside of the old one. The Terlingua M. Co. (Lindheim & Dewees) has recently built a forty-five-ton furnace, which can be urged up to fifty tons. Thesc furnaces are all of good construction, and some of tbe brick for them are made within a few miles, tbe firebrick being hrought in from St. Louis. Both wood and water are scarce. At the present time most of tbe water is being hauled from the Rio Grande, a distance of about 12 miles.—Texas Mineral Survey Bulletin No. 2.

Moose Creek Placers.

Written for the MINING AND SCIENTIFIC PRESS.

This property, situated in the Newsome district in Idabo county, Idaho, is a good example of a placer property with a long life. Every season since 1862, and by all metbods from rocking to hydraulicking, it has heen in operation, and there is known grouud in sight at the present seasonal ground breaking rate for twenty-five to thirty years' operations yet.

Tbe property has been througb many hands, white and Chinese. Tbe latter, while mining up the side gulches, first opened—if they did not discover—the "Old Channel" ground, lying on the ridges and paralleling tbe present South Fork of tbe Clearwater, which lies some 800 feet helow. They mined upwards of 1,500,000 yards of gravel. Tbe property was jumped hy white men and eventually came into the hands of the present owner.

Tbere are at present 22 miles of ditch appurtenant to the property, tbe principal one, 12 miles long, 36 inches wide on the bottom and 20 inches deep, mostly on a grade of $\frac{3}{8}$ inch to the rod, carrying 900 cuhic feet of water per minute. With 30-inch flume, 24 inches deep, on 6½ incb grade per 12 feet, and one No. 2 giant witb 4-inch nozzle, under 160 feet pressure, working on a bank 120 feet deep, about 1500 cubic yards of gravel per day is washed.

The Western, or No. 3, gravel deposit at present being worked is 1100 feet long, so far as sbown by the present workings, of a deptb of 185 feet under the top of tbe ridge, and widtb of 550 feet. Neither the width nor depth of the deposit has been determined yet. Sbafts sunk to determine the width, sbowing "hedrock" at 8 feet depth and ergo the north rim, have since been mined out, sbowing 75 feet of gravel under the alleged bedrock and no sign of the true hedrock as yet. One season's work only has been done as yet on this deposit and the extent and direction, beyond the dimensions given, are somewhat bazy.

The formation beneatb the deposits on this property has all been extensively faulted since the gravel was deposited, the fault lines running to the grass roots and the strata of sand and gravel showing beautifully the depth of the throw. The existence of tbese faults nullifies the prohable value of sinking shafts to bedrock to determine the level of the bottom of tbe channel. Nine shafts were put in the middle or No. 2 deposit and it was imagined the level of the channel hottom and even its grade had been determined. Suhsequent mining sbowed 14 feet of gravel helow the level of tbe bottom of the lowest shaft. The bedrock flume, put in from the shaft data through 400 feet of rock work, failed to hottom hy about 6 incbes in depth an area not more than 8x40 feet, as tbe deep place cbanced to he toward the lower end of flume. That is what might he called bull-headed luck. The location of this depression 300 feet fartber up the flume line would bave left tbe flume 12 feet in tbe air.

As a result of this experience, having on the west deposit 800 feet vertical available for dump, the sluices have been put in: the upper line 215 feet helow the level of the top of the deposit, the lower 315 feet helow, and mining commenced. If the mining develops the fact that the deposit goes helow the upper flume it will be pulled out. This seems haphazard work, hut was deemed advisable under the circumstances.

The gravel is largely decomposed, hreaks readily under the stream and carries comparatively few boulders, ahout 100 pounds of No. 2 powder being used per month for "bulldozing" houlders, practically no houlders being drilled, and none left on hedrock. The gold is mostly fine, less than 1% running the size of a grain of wheat. Last year's (1901) shipments graded 925 fine. The pay is seemingly distrihuted throughout the whole of the depth of the hanks in more or less erratic pay streaks and hunches. In places tbe deposition of gold is heavier on the bedrock, in other portions of the channel the bedrock is as lean as any portion of the upper banks.

A Problem of Economy.

By W. H. WAKEMAN.

The following problem was presented to the engineer of a new mill, with a request to solve the same, and as it involves the consideration of several matters that should interest steam engineers, it is presented here for the benefit of those seeking information along these lines. Two engines were presented as candidates for supplying power to run the machinery, and the owners wanted to know which would be the most economical when all things were considered. They will be designated as No. 1 and No. 2, the dimensions of which are as follows:

No. 1—Cylinder 14x42 inches; speed 100 revolutions per minute; boiler pressure 100 pounds with cut-off at ¼-stroke.

No. 2—Cylinder 16x36 inches; speed 80 revolutions per minute; boiler pressure 110 pounds, with cut-off long enough to develop the same power as No. 1 under given conditions. Which will take the least steam? The first point is to determine the power developed by No. 1. The area of piston is 154 square inches. The mean effective pressure possible to realize is determined by the following formula:

$$\frac{1 + \text{Log} \times P}{R} - B = \text{M. E. P.},$$

in which Log = hyperbolic logarithm of the expansion rate, P = the absolute initial pressure, R = the ratio of expansion, or the expansion rate, B = the absolute back pressure, and M. E. P. = mean effective pressure.

As the cut-off takes place at ¼-stroke the expansion rate is 4, the hyperbolic logarithm of which is 1.3863. The initial pressure is taken at 100 pounds by the gauge, as it will be less than boiler pressure, making it 115 pounds absolute. The back pressure will be taken at 17 pounds absolute. Substituting for the figures their values and solving the problem results as follows:

$$\frac{1 + 1.3863 \times 115}{4} - 17 = 51.6 \text{ mean effective pressure.}$$

The piston speed is $(42 \div 12) \times 2 \times 100 = 700$ feet per minute, and the power developed is:

$$\frac{154 \times 51.6 \times 700}{33{,}000} = 168.5 \text{ H. P.}$$

For comparison, it is necessary to determine the volume of steam used to develop power in both cases, when the following formula may be applied:

$$\frac{A \times P \times S}{1{,}728} = F,$$

in which A = area of piston in square inches, P = length of stroke to point of cut-off in inches, S = number of strokes per minute, and F = cubic feet required per minute. Applying this to the case of No. 1 results as follows:

$$\frac{154 \times 10.5 \times 2 \times 100}{1{,}728} = 187 \text{ cubic feet per minute.}$$

Turning our attention to No. 2 we find that the area of piston is 201 square inches, and the piston speed $(36 \div 12) \times 2 \times 80 = 480$ feet per minute. It must develop 168.5 H. P., which gives all the required factors except the mean effective pressure. To obtain this the following formula may be used:

$$\frac{\text{H. P.} \times 33{,}000}{A \times S} = \text{M. E. P.},$$

in which H. P. = the H. P. developed, A = area of piston, S = speed of piston in feet per minute, and M. E. P. = mean effective pressure. Applying this formula to the case in hand, results as follows:

$$\frac{168.5 \times 33{,}000}{201 \times 480} = 57.6 \text{ pounds mean effective pressure.}$$

The next step is to determine the point of cut-off that will give 57.6 pounds mean effective pressure under stated conditions. Casual observation will present the idea that by taking the formula given for the purpose of finding the mean effective pressure, and changing it slightly, with the mean effective, initial and back pressure given, it will be possible to form one by which the point of cut-off will be determined, but this is not practical because there are two factors missing, namely the ratio of expansion and the hyperbolic logarithm of the same, therefore it becomes necessary to assume a ratio of expansion, applying the mean effective pressure and note the result. If it is too high, then take a shorter point of cut-off, and solve the problem on this basis. If too low take a longer point of cut-off and try again. If we claim that the mean effective pressure on a non-condensing engine working under fair conditions and cutting off at ¼-stroke is one-half of the boiler pressure by the gauge, it will be nearly correct, as illustrated by the foregoing case, where the boiler pressure is 100 pounds and the mean effective pressure 51.6 pounds on the 14x42-inch engine. Following out this suggestion, we see that in order to secure 57.6 pounds under the same conditions our point of cut-off must be a trifle longer than ¼-stroke, so we will assume it to take place at $\frac{9}{32}$-stroke, or putting it in decimal form, at .28125-stroke.

The rule for determining the ratio of expansion, when all dimensions are in inches, is to divide the stroke by the distance traveled by the piston at the point of cut-off, but in this case it is stated in fractions of the stroke, therefore it becomes necessary to divide 1 by the given fraction.

$1 \div .28125 = 3.55$, the hyperbolic logarithm of which is 1.2669. Again applying the formula for determining the mean effective pressure results as follows:

$$\frac{1 + 1.2669 \times 115}{3.55} - 17 = 56.43 \text{ pounds.}$$

This is 1.17 pounds less than is required, but when we take the cut-off at $\frac{5}{16}$-stroke, it is three pounds more than is wanted, therefore the former is nearer right, and near enough for all practical purposes.

This demonstrates that the 16-inch engine will cut off at $\frac{9}{32}$-stroke to be equal to the 14-inch cutting off at ¼-stroke.

As we wish to know how many cubic feet of steam per minute this calls for, it is necessary to multiply the stroke by the point of cut-off, and $36 \times .28125 = 10.125$ inches.

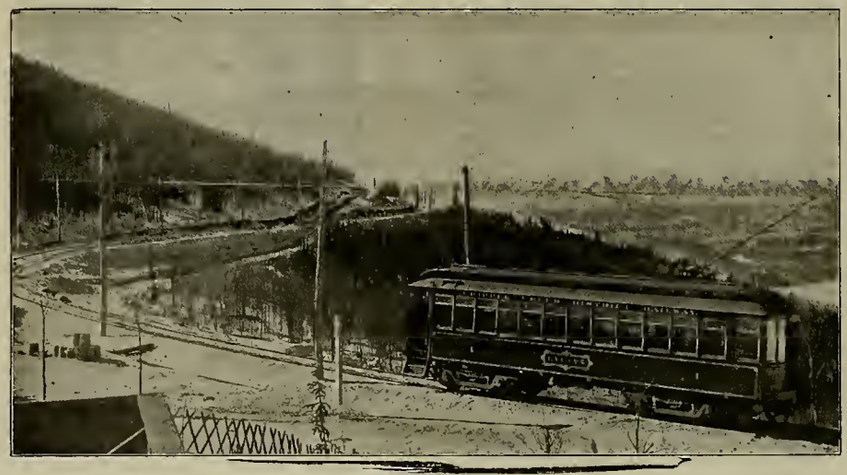
The capacity of this cylinder under these is determined as follows:

$$\frac{201 \times 10.125 \times 2 \times 80}{1{,}728} = 188 \text{ cubic feet per minute.}$$

The above demonstrates that both engines use practically the same quantity of steam in a given time, therefore if one is any better than the other, it is due to other causes.—Electricity.

Cripple Creek, Colorado.

With this appear two new views of Cripple Creek, Colo., railways. The view with the electric car so



prominent is from "Midway" station on Bull Hill, 10,514 feet above sea level, looking southwest to the Arkansas River valley, with the Sangre de Christo mountain range in the distance.

TELPHERAGE is the "transmission of vehicles by electricity to a distance independent of control from the vehicle." The word is derived from the Greek words meaning far-carrying, the first syllable being of the same derivation as that in telegraph and telephone. Aerial telpher lines may be of either cable or rail construction, the former being far more common, and the latter, on account of its high cost, being confined to relatively short lines where heavy loads and special conditions warrant its use. The electrically driven carrier which runs upon the cable is called a telpher, and is of the simplest construction. There is no gearing, the grooved wheel which runs upon the cable being fixed directly upon the motor shaft, which is made large in diameter and runs in amply proportioned bearings adjacent to the wheel, to sustain the total weight of the motor and load.

Mathematics and Engineering Literature.

The notation of mathematics was invented as a sort of shorthand assistance to thought. Its present use seems very largely to be definable by Talleyrand's famous description of language—a means for concealing thought.

It has come to be the fashion, in papers presented before engineering societies and written for the technical press, to use a complicated and incomprehensible variety of mathematical symbols, often for the expression of the simplest statements. Now, it is an axiom that nothing ever was under any circumstances expressible in a mathematical formula that could not as well, if not as briefly, be expressed in the English or any other reasonable language. And further than this, some of the very greatest work in engineering literature and in the expression of science has been done in language which is comprehensible to any person of ordinary intelligence.

If we go back and look at the work of the fathers, of those who laid the foundations of modern engineering and science, we find that in most cases they clothed the thoughts which they wished to present in language so simple that often to-day it stands as an example of clearness of expression. The work of Faraday was probably as far-reaching, as comprehensive and as fundamental as had ever been done; yet his writings are models of simple diction and clear statement. Tyndall did more for science in the English speaking world than almost any one man of his generation by translating the mathematical labors of his contemporaries into good, plain English. This is not to be thought of as in any way a reflection upon the great importance and immense value of mathematical demonstration and expression, but the fact remains, nevertheless, that with very few exceptions demonstrations, difficult and abstruse when expressed in the formulæ and symbols of mathematics, become clear, evident and satisfactory when written in intelligent language. And they reach a far wider audience—they are more convincing, they go further.

It is betraying no secret to state the fact that a paper before an engineering society, or an article in a technical journal, commands a kind of reverent re-

spect from the uninitiate when it bristles with equations and integral signs; but such papers are listened to by the few and read only by those whose immediate interest tends in their direction.

Take the same subject and the same treatment, put it in plain English, illustrate it with meaning diagrams, and note the difference.—Electrical Review.

Mining as a Profession.

Written for the MINING AND SCIENTIFIC PRESS by J. B. BALCOMB.

Every young man who arrives at the years of maturity confronts the question as to what to do for a living. To a young man of limited means or opportunities a mistake means more than to others, for he has less chance of retrieving his loss. Some men are fitted to toil almost altogether with the brain, others do better at an almost purely physical employment, but the vast majority never succeed well except when engaged in an occupation requiring the use of both hand and brain.

It is with this latter class in view that we suggest mining as a profession. Mining was formerly supposed to be almost entirely a matter of hand training. Of late, unfortunately, some schools and universities have swung to the other extreme and teach it as though it were a matter of brain culture susceptible of being taught from books, with an occasional field exercise or visit to a mill or smelter. Both ideas are equally erroneous and lead to like results, although in entirely different directions.

The bookman is wedded to his books and the miner to his pick and shovel. Fortunately, there has arisen a class of mining engineers and mine owners who realize that somewhere there lies a golden mean. This has given an impetus to practical training and is the only kind of an education that has any market value in the mining world.

That mining as a profession is one of the best paying and most useful is well recognized here on the Pacific coast. With the establishment of schools of higher learning came men well versed in scientific researches and able to predict to a nicety the exact metallurgical result to be expected under ideal conditions. Their students were taught precise methods and exact determinations. But the mining world promptly repudiated them because, while they know enough, they could practically do nothing in the way to which miners were accustomed or in any way to achieve commercial success. And so the belief took possession of miners that an education was a detriment to a man in mining. Yet the failure of self-made men to adapt their processes to new ores, and the large per cent of values always found in the tailings, kept forcing home the conviction that there was still something lacking.

This lack is largely to be found in the system of education adopted. Schools teaching young men actually to carry on the processes of mining and milling, and at the same time teaching sufficient of the underlying reasons and principles to enable them to adapt their knowledge to different mines and conditions, are finding favor everywhere with the mining profession. It is to such schools as these that young men should turn when considering mining in the light of a profession for life. Attend some school which is devoting its efforts exclusively to this line or work and has courses that are thorough and practical from the ground up. The advantage of such an education to young men wishing to prepare for this profession can not be overestimated. It gives them exactly what they need to go into mines and work understandingly.

As in other professions, a large part of the best practical experience has been embodied in the form of books and is being continually augmented by the current mining and technical journals. A man must not consider his education finished when he has completed the course in some school or college, but must make use of these hooks and periodicals in order that he may keep posted on what others are doing and be able to push himself to the front.

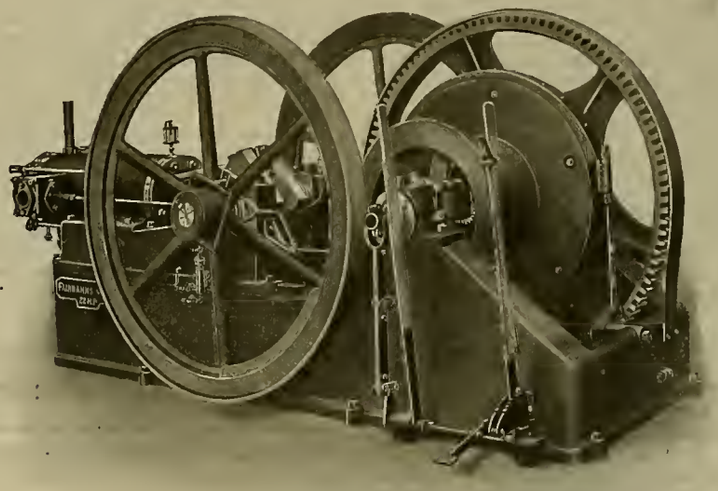
There is no question but what mining as a profession pays better in health and in dollars and cents than any other profession. To succeed in it requires the same devotion to study, the same close attention both to underlying principles and to details of operation, and the same untiring energy and determination, to succeed as in other professions. An occupation that pays ordinary laborers from $2 00 to $3.00 a day cannot but pay its professional men good salaries. This is just what mining does. The reason for this is found in the fact that an incapable man can cause a company to lose large profits, and in many cases actually to sink a fortune without making a cent. There are hut very few lines in which individual judgment and educated common sense go so nearly to making the whole difference between success and failure. Like every other business, a man cannot expect a $10,000 salary from the start, hut he can expect a good margin above expenses and rapid advancement, hoth in salary in position, if he will hut qualify himself to succeed in responsible places. Do not be satisfied with what you have, or what you are, if you are capable of something better. Fit yourself to succeed, and then be satisfied with nothing less.

The probability of receiving a high salary is much more true in metal than in coal mining. It is also true that there is much more room for individual effort to be recognized and rewarded in the great West than in the overcrowded East. Progress in milling processes is nowhere so rapid as in the mining camps of the Rocky mountains and on the Pacific coast, and hence these offer the greatest opportunities for hard work and careful attention to be recognized and rewarded.

In whatever branch of mining you qualify yourself, and whatever State or region you choose as your field of labor, remember that success is achieved only by careful preparation and through unremitting toil and endeavor.

New Gasoline Hoist.

Herewith is illustrated the gasoline geared hoist, manufactured by Fairbanks, Morse & Co. of Chicago, Ill., which machine is receiving attention in mining



operations, particularly where fuel and water are scarce. The manufacturers state that a large number of machines of this type were installed last year. The sizes range from 6 H. P. to 44 H. P., inclusive. The special advantage in using a gasoline hoist is that it entirely dispenses with the difficulty often experienced at mines in delivering solid fuel for a steam boiler. There is little water required, and in cases where the water is bad and impregnated with alkali and kindred chemical impurities that necessitate repair and expense in connection with the tube and boiler shell, that expense is dispensed with.

The saving in cost, as compared with steam, is great, but it is difficult to give an exact comparison, as the comparative cost of fuels differ in different sections. A statement made in a recent letter received from a user of one of these machines covers the economy, as compared with steam, as follows: "The cost of operating the gasoline hoist is less than the water used for a 6x8-inch double steam hoist which did the same work that the gasoline hoist is now performing." Others have hoists of an average of 25 H. P., and these have been operated ten hours on 2½ gallons of low-grade gasoline. When a shaft is being sunk at the end of a tunnel, these hoists are found convenient, as the hoist can be set in the tunnel and operate direct into the shaft; while in the case of steam it would he necessary to locate the boiler outside of the tunnel and convey the steam back into the tunnel to the point where it was to be used for hoisting.

These machines are ready to start at a moment's notice and give out power at once. These engines have a patent self-starting device, which enables one man to start any sized hoist with perfect ease. The general construction of this hoist is simple and strong.

Mines Near Clifton, Arizona.

[STAFF CORRESPONDENCE.]

The New England Copper Co., of which A. P. Ayling is manager, is developing the old King group, located 5 miles north of Clifton, near the top of the range, overlooking the San Francisco river. This property produced considerable high-grade ore about twelve years ago, which was smelted at a furnace on the river. The company's present holdings cover about 3000 feet along an ore belt that strikes from northeast to southwest. This belt is within a porphyry dike which cuts through a granite country rock. Development shows the ore body to be from 50 to 100 feet wide, varied by intrusions of the porphyry. Development consists of considerable open-cut work, three different shafts, each about 100 feet deep, and a 700-foot tunnel. The most of this work is in ore, which in the main is copper glance, with some red oxides and carbonates. Much of the glance runs over 70% copper. The material hoisted in sinking a 130-foot shaft ran 20% copper. Manager Ayling states that the ore now on the dumps is worth $200,000. Gasoline engines are used in hoisting. Water is now carried on hurros up a steep trail from the river to the mine, making an ascent of about 2000 feet. Development will be carried on extensively and future plans contemplate the erection of a tramway line from the mine to the river and the building of a smelting plant at the latter place.

The Clifton Con. copper mines, L. A. Dunham manager, comprise holdings on both sides of the New England group, covering extensions of the same belt. The principal operations of this property are on the northern slope of the mountain, extending nearly to the river. The feature of Mr. Dunham's work is the driving of a deep tunnel, which strikes southwesterly, along the course of the ore belt, through his own group and that of the New England Co., cutting 1200 feet below the apex of the mountain and about 1000 feet below Mr. Ayling's workings. This tunnel is in about 800 feet and is double-tracked. Durkee electric drills are being used. A number of tunnel drifts are being run on the vein at various points above the main tunnel. This property comprises fifty claims. On the north end of the group the ores are copper glance and a good deal of gold.

On the east side of the San Francisco river is a gold belt, the ores there carrying free gold and sulphides. Dell M. Potter has considerable holdings there which he is developing by a crosscut tunnel. A singular thing here is that this tunnel has run into an intensely heated section of syenite rock at 200 feet from the entrance. The heat is too great to permit the continuance of the work. WASCOTT.

Clifton, Ariz., Feh. 18.

The Henry Train Lighting System.

Written for the MINING AND SCIENTIFIC PRESS by C. F. ELLIGTT.

By this system the running of the train is made to develop the electric current for the lights. A generator is mounted on a bushing, the outer fields and casing being journaled on the ends of the hushing. The hushing is then mounted on the axle by removing one of the wheels from the axle, the wheel being then pressed on again. This entire operation can be accomplished in less than an hour in any well equipped railroad shop. After the bushing is placed over the axle, two rubber plugs, reinforced by a steel shell, are forced between the hushing and the axle, binding the hushing to the axle, forming an elastic connection between the two. This method of connecting absolutely eliminates any serious vibration from the rail joints, being transferred to the delicate part of the generator.

With the adoption of the direct-connected generator, belts or gears are avoided, and with them all difficulties of alignment.

The form of generator employed is an eight-pole machine, four poles being to the right, the other four to the left. There are two separate armatures, having between them a single commutator. With this method of construction, the necessary efficiency is secured at slow speed. The output of this generator at 15 miles an hour is 52 volts and 40 amperes, the revolutions being about 2000 per minute; the weight, including bushing, plugs and generator, is under 700 pounds.

As railroad coaches are not always run in the same direction, a device to reverse the direction of the current automatically is provided. The two brush-

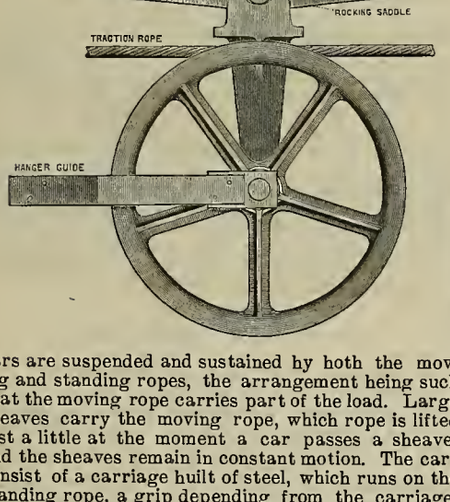
holder rings are run in grooves on the inner surface of the field casing. When the generator is revolving in one direction, the brushes are brought over to a point on the surface of the commutator, from which the greater current is taken; when the direction of rotation is reversed, the brushes are allowed to move over until the positive brush still takes the positive current from the commutator; the brush rings are then held in this position. The entire operation is automatic and certain of results. The neutral points on the commutator being located, stops are placed opposite them, which stop the brush from passing the point.

One switch is employed to perform all of the operations. This is a double solenoid carbon brake switch, which throws the entire device in operation when the line voltage reaches 52. The following operations are performed by this one switch: When the speed of the generator is not sufficient to produce 52 volts, the switch is inactive, but in its inaction it places out of circuit the entire generator and regulating devices. The moment the voltage of the line reaches 52, the switch is thrown over with a positive interlocking motion. The immediate result of the acting of the switch is that a circuit is made through the motors of the regulator, which is instantly placed in operation and maintains a uniform voltage, no matter if the speed of the train reaches 100 miles per hour. Simultaneous with this regulator being placed in operation, the lamps and other devices which were being fed by a storage battery are thrown out of the battery circuit and placed in the main circuit of the generator; the surplus current, however, which is not used by these different devices, is fed into the battery for future use, when the speed of the train is not sufficient to generate the necessary current or when the train is standing still.

The weight of the equipment for a car, including generator and batteries, is under 1500 pounds. The system is intended to be supplied to each car; but a generator can be built which will supply the whole train. Each car has a separate set of batteries, which are charged when the train is in motion, and when disconnected or standing still the lights will still continue to burn.

The Dusedau Wire Rope Tramway.

Herewith are illustrated some features of the Dusedau system of wire ropeways, manufactured by the Broderick & Bascom Rope Co., St. Louis, Mo. The



cars are suspended and sustained by both the moving and standing ropes, the arrangement being such that the moving rope carries part of the load. Large sheaves carry the moving rope, which rope is lifted just a little at the moment a car passes a sheave, and the sheaves remain in constant motion. The cars consist of a carriage built of steel, which runs on the standing rope, a grip depending from the carriage, and a frame or hanger attached to the grip carrying the bucket. The grip holds the moving rope by friction and works automatically. The grip is attached to the moving rope by an inclined plate in the path of the attaching rollers. It is detached from the rope by another inclined plate striking the rollers on the opposite side. There are no objections to intermediate main stations, as the cars pass from one section of the line to the other without handling. The vertical position of the car is not affected by the moving rope. The grip is free to turn in its bearing. While passing a tower the car is guided by a hanger guide. A tramway of this make, 12,500 feet long, was recently completed on the Contention mine, near Silverton, Colo.

Must Explore on the Veins.

Judge Gilbert of the U. S. Circuit Court at San Francisce, Cal., in a decision in the case of the St. Louis M. & M. Co. of Montana, and W. Magger, appellants, vs. the Montana M. Co., Ltd., the case being on appeal from the U. S. District Court of Montana, says:

Plaintiff is owner of the St. Louis lode mining claim and the Montana M. Co., Ltd., is the owner of the Nine Hour lode mining claim. Appellants were proceeding to drift a tunnel 260 feet underground horizontally from the St. Louis claim eastward and into the Nine Hour claim for the purpose of reaching the mining lode which had its apex in the St. Louis claim and which they had a right to pursue in its downward course as it passed from its dip to the eastward within their side lines into the Nine Hour claim. It was stipulated that the tunnel, if projected in the course in which it was being drifted, would reach a vein or lode which had its apex within the St. Louis claim, and that in the course of its progress there would be encountered no other vein, lode or ledge. The appellants were enjoined from proceeding with the work.

The case involves the interesting question whether the owner of a mining claim, who has a right to pursue beyond the side lines of his claim a vein or lode which has its apex within his own claim, is confined in his route of exploration within or upon the vein itself and is without authority to otherwise enter an adjoining claim. There is no warrant for saying that they have any general right of exploration within land on an adjoining patented claim whether upon or below the surface. The right of exploration is given for the purpose of making discovery of mineral. Of what avail would the right of exploration be if no benefit could be obtained from discovery made thereby? The ground covered by a subsisting valid mineral location is open to exploration only by the owner thereof. The statute gives the appellants the right to follow the vein which they were seeking to reach by the tunnel, but it confers upon them no right to approach it from any point other than the vein or lode itself.

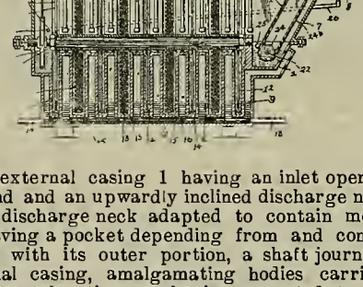
A patent when issued is a grant of land with all of the rights incident to common law ownership. In addition to the land there is the right to pursue such veins, lodes and ledges extralaterally in case they depart from the perpendicular and extend beyond the side lines of the claim. The decree of the court below is affirmed.

Mining and Metallurgical Patents.

Patents Issued March 4, 1902.

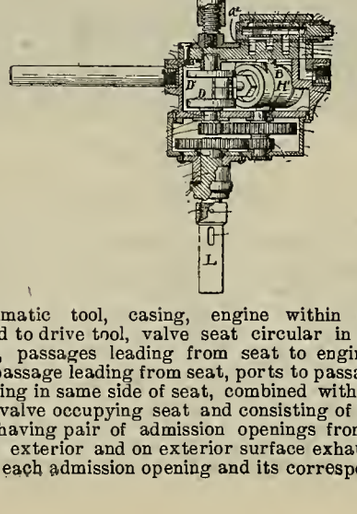
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

AMALGAMATING MACHINE.—No. 694,112; G. C. Scott, Columbus, Ohio.



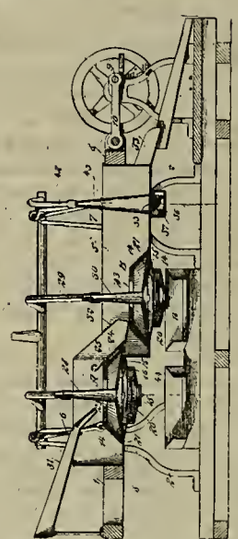
An external casing 1 having an inlet opening at one end and an upwardly inclined discharge neck at other, discharge neck adapted to contain mercury and having a pocket depending from and communicating with its outer portion, a shaft journaled in external casing, amalgamating bodies carried on shaft, an elevating mechanism mounted to run in discharge neck and carrying mercury cups and amalgamating plates, cups and amalgamator plates adapted to run in a body of mercury contained in lower portion of discharge neck and in lower portion of external casing and a pipe connection between mercury pocket 8 and opposite end of external casing.

PNEUMATIC DRILL. — No. 694,714; T. Barrow, Cleveland, Ohio.



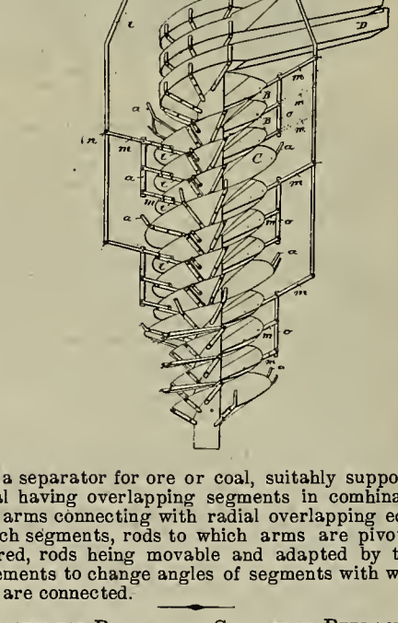
Pneumatic tool, casing, engine within casing adapted to drive tool, valve seat circular in cross-section, passages leading from seat to engine, exhaust passage leading from seat, ports to passages in seat being in same side of seat, combined with oscillating valve occupying seat and consisting of hollow barrel having pair of admission openings from interior to exterior and on exterior surface exhaust recesses, each admission opening and its corresponding exhaust recess being oppositely arranged longitudinally of valve from other admission opening and recess, there being opening for admission of operating fluid to interior of valve.

GOLD SEPARATOR.—No. 694,255; A. L. Dana, Colorado Springs, Colo.



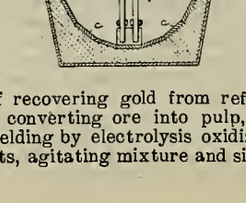
A pan, a trap arranged therein, comprising an upwardly and inwardly tapered hood having an inwardly and downwardly extended flange at its upper edge, a dished ring plate on which hood is supported, a tray attached to under side of ring plate and having a valve controlled opening in its bottom, a dished perforated disk supported in tray, an upwardly and inwardly inclined spreader plate having spaced legs resting on ring plate, and a water supply pipe leading through spreader plate.

SEPARATOR FOR ORE OR COAL.—No. 694,420; J. N. Rice, Scranton, Pa.



In a separator for ore or coal, suitably supported spiral having overlapping segments in combination with arms connecting with radial overlapping edges of such segments, rods to which arms are pivotally secured, rods being movable and adapted by their movements to change angles of segments with which they are connected.

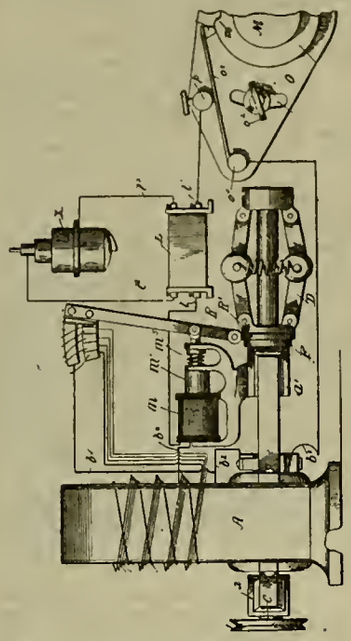
PROCESS FOR RECOVERING GOLD FROM REFRACTORY ORES.—No. 694,349; H. R. Cassel, New York, N. Y.



Process of recovering gold from refractory ores consisting in converting ore into pulp, adding salt capable of yielding by electrolysis oxidizing and dissolving agents, agitating mixture and simultaneously

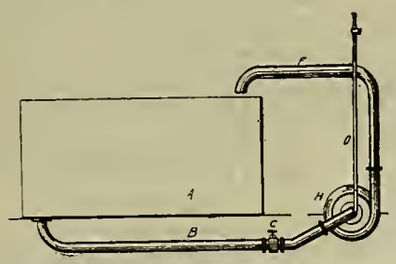
electrolyzing it under such conditions as to oxidize refractory elements, dissolve gold and reprecipitate it in form of black powder, finally adding solvent to redissolve such black powder.

ELECTRIC IGNITING APPARATUS FOR EXPLOSIVE ENGINES.—No. 694,409; S. F. Neill, Bradford, Pa.



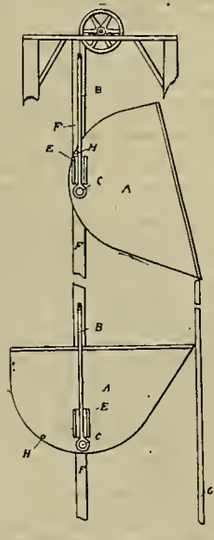
In an explosive engine, combination with igniting device, of electric generator therefor provided with coils for increasing normal magnetism of field magnets and series of demagnetizing coils of different resistances, circuit controller connected with coils and governor operated by speed of engine, operatively connected with circuit controller.

CYANIDE PROCESS OF EXTRACTING PRECIOUS METALS FROM ORES.—No. 694,521; B. W. Begeer, Florence, Colo.



Process of treating material containing the precious metals, consisting in setting in motion in an endless path solution of cyanide of potassium, introducing oxygen to moving liquid, and finally subjecting metal hearing material to action of solution.

SELF-DUMPING HOIST.—No. 694,579; E. L. Ransome, New York, N. Y.

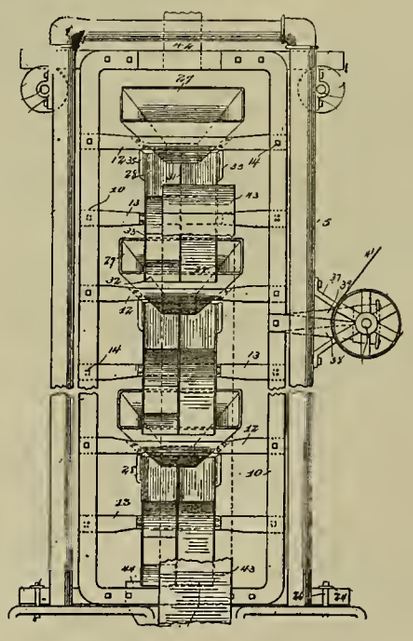


A hoisting tub swung on hail wherein it overturns by its own weight, in combination with fixed guides upon which hail moves, stop to prevent tuh from overturning too far, and guide rail in front of tuh which retains tub in position and upon top of which tuh tips, the hoisting tuh A swung in bail B in combination with fixed guides F and guide bar G.

ORE CONCENTRATOR.—No. 694,444; W. Thurmond, Hillsboro, New Mex.

An ore concentrator provided with draft chamher, inclined reciprocating screen therein, suction box into which opens draft chamber to create draft therein, and to permit coarser material to pass from screen of draft chamber into suction box, two hoppers arranged within suction hox one alongside the other, one heing directly below discharge end of screen, this hopper receiving coarser ore, the other the tailings, and an elevator for receiving coarser ore from hopper.

ORE SAMPLER.—No. 694,734; C. R. Foster, Blue Island, and W. Coolidge, Chicago, Ill.

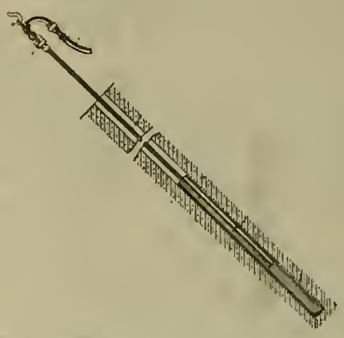


An ore sampling machine, comprising in combination upright supporting frame, pair of vertical frames mounted side hy side so as to he capable of lateral reciprocation within supporting frame, series of hoppers and dividers fixedly secured in vertical frames respectively so disposed as to present series of alternate hoppers and dividers, discharge chute disposed in front of series of hoppers and dividers having those portions of its rear wall opposite lower ends of discharge chambers of dividers cut away to receive discharge therefrom, and means for imparting to vertical frame simultaneous lateral reciprocations in opposite directions.

REFINING COMPOSITE METALS.—No. 694,699; T. Ulke, Sault Ste. Marie, Canada.

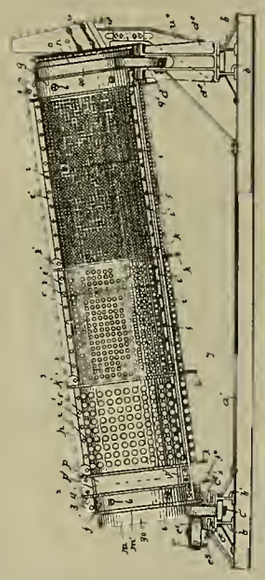
The process of refining nickelliferous-copper material consisting in electrolytically depositing copper from acid solution of such material with anode of same material; periodically withdrawing portion of electrolyte as it becomes poorer in copper and richer in nickel, separating copper and nickel salts contained in withdrawn electrolyte; electrolytically depositing nickel from non-acid bath of nickel salt by use of insoluhle anode; periodically withdrawing and concentrating portions of impoverishing nickel bath, and periodically restoring to copper and nickel baths, respectively, copper and nickel salts obtained from withdrawn solutions.

PROCESS OF BORING HOLES IN ROCK, ETC. — No. 694,534; F. H. Davis, New York, N. Y., assignor to Davis Calyx Drill Co., New York.



Process of boring holes in rock, or similar material in the earth's strata, consisting in milling or grinding same with free or loose material, introducing water under pressure into hole to carry up millings or grindings, and, after hole has reached a predetermined depth, maintaining substantially uniform pressure upon water at bottom of hole, regardless of depth of latter, to carry millings or grindings portion of the way only to surface of the hole without carrying milling or grinding material therewith, and catching millings or grindings at point intermediate bottom and top of hole.

REVOLVING SCREEN.—No. 694,565; V. W. Mason, Jr., New York, N. Y., assignor to Taylor Iron & Steel Co., Highhridge, N. J.



In revolving screen, an inclined revoluble cylinder consisting of frame comprising end rings f, g, secured together by longitudinal bars h, sectional screen plates secured to hars h, to present perforated divisions, end ring m fitted into ring f of frame, secured thereto hy holts and having circumferential flange m′ abutting against end of ring f, also having roller-receiving surface 30, and roller-receiving surface 50, pair of cylinder supporting rolls engaging roller-receiving surface 30, and roll engaging roller-receiving surface 50 turning on vertical axis in alinement with perpendicular radius of cylinder, which receives end thrust of cylinder.

ACCORDING to Prof. J. B. Harrison, the Government Geologist at Georgetown, diamonds have been found in three districts of British Guiana—in the north on the upper waters of the Barima river, on the Barima river ahout Ianna, some 60 miles to the southeast, and in the Upper Mazaruni hasin, in a district which, so far as geological indications go, may extend over the tract of country between the headwaters of the Mazaruni and Puruni rivers, though up to now all discoveries have been made ahout the hasin of the Putareng river. There is also the Omai district on the Potaro, a tributary of the Essequibo river, which lies in a southerly direction from Georgetown. This wide diffusion of the gem shows that the chances of enlarging the area in which it may be mined are favorahle. The diggings at present are confined to the Putareng and Potaro districts. There are a dozen companies either mining or prospecting in the first named district and others are heing formed.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

JUNEAU.

G. Kyrage and J. Dumas, of Juneau, have sold the Greek Boys group on Berners bay, near Juneau, to an Eastern company represented by E. S. Sutherland.

The February 15th report of the Alaska-Treadwell M. Co. shows for the preceding thirty days 35,667 tons of ore crushed, valued at $36,279, and saved 815 tons of sulphurets, of the value of $32,267. Gross yield for the month was $78,617, the ore averaging $2.20. The working expenses were $61,138.

KETCHIKAN.

The exploration tunnel, at the Ketchikan G. Co.'s property at Sealevel, Thorne Arm, has been driven across the ledge formation and discloses, in addition to the 18 inches of gold bearing quartz on the footwall, 10 feet of quartz porphyry and 10 inches of quartz on the hanging wall, all well mineralized and carrying good values. The quartz porphyry assays up to $8 per ton, and the quartz on the footwall side assays between $13 and $14 per ton.

KUYUKUK.

Hammond river, Kuyukuk, is reported to be the center of attraction in this district. Hammond river was discovered late last fall. It has been staked for a distance of 40 miles. None of the claims have been prospected except the discovery claim, owned by Sullivan & Jacoby. The pay streak is from 1 to 4 feet to bedrock and is 200 feet wide. According to a letter written by V. V. Lowry, who has been in that section two years, the owners of the claim take out five or six buckets of frozen gravel per day, which they take to their cabin. At night they thaw it and realize from $75 to $125. Other claims on the river are thought to be equally as rich. The winter diggings on the Kuyukuk are turning out well. Claims Nos. 6 and 9 are yielding from 17 cents to $1.25 to the pan.

ARIZONA.

COCHISE COUNTY.

At the foot of the Chiricahua range, a discovery of placer gold has been made within the past few weeks. The gold bearing gravel extends along the foothills a distance of 5 miles, and down towards Sulphur Springs valley for 3 miles. The gold is coarse, well washed placer gold, of high grade, running over $18 per ounce at the mint. But little work has been done. In one place a small trench of about 50 feet in length, 2 feet wide and 18 inches deep, has been run in a small gulch, and from it nearly $1000 of gold, it is claimed, has been taken out by panning. The hills surrounding the gulches all prospect.

The Roosevelt G. & C. M. Co. has been incorporated at Bisbee for the developing of some mining property on the White Mountain Indian reservation, by W. G. McDonald, J. H. Jacks and B. Jones.

MOHAVE COUNTY.

The Grand Gulch mine is located about 40 miles northeast of Gregg's Ferry, on the north side of the Colorado river. Jennings Bros. have control of the property and have been opening the mine for extensive future working. A two-compartment shaft is down 400 feet. A 40 H. P. gasoline hoisting engine has been installed. During 1901 a production and shipment of 100 tons of ore monthly has been maintained. The average copper content of this ore is claimed to have been 48%.

The Empire Flat copper mines are reported sold to New York people, who it is stated will soon have a force of men at work. The mines are located about 6 miles from the Colorado river, near the mouth of the Bill Williams.

The Yellow Aster mine, near Kingman, is reported to show in the bottom of the shaft ore which goes fifteen ounces in gold and eight ounces silver to the ton. The mine is owned by E. H. Harrison, H. Yoe and J. C. Hughes.

It is reported that on the 300 level of the Schuylkill mine, at Chloride, a big ore body has been cut in a crosscut. On this level a recent flow of water compelled the temporary stoppage of work. It is now under control and used for the operation of the mine.

It is reported that the Philadelphia & Arizona people have leased the water of the Payroll mine, at Chloride, and will at once pipe it to the mill at the Minnesota-Connor mines. The work of sinking on the Minnesota is going steadily and is in ore.

On the 500 level of the Schuylkill mine at Chloride, W. D. McNeil Supt., a rich body of silver ore has been struck. The ore shows a large amount of native and ruby silver all through it.

S. C. Bagg, manager of the New Comstock M. Co. of Los Angeles, Cal., has taken a long term lease of the Sheeptrail mill, near Chloride, and intends at once to put it in shape to operate on Catherine mine ore.

PINAL COUNTY.

J. McCarthy, Supt. of the Bryan group, near Riverside, is at work drifting in ore on the vein from the bottom of the No. 2 shaft, at a depth of 100 feet.

Supt. Brown of the Fernando M. Co. has taken over the Chamberlain properties of the Willow Springs, which were bonded to the Fernando Co. by M. R. and F. A. Chamberlin, the final payment having been made.

SANTA CRUZ COUNTY.

The Hardshell mine, near Nogales, closed last year by a cave-in, has been reopened by R. R. Richardson.

YAVAPAI COUNTY.

G. A. Wright, representative of the English syndicate of London, has bonded at $30,000 the Mountain View and Northfield gold claims, situated in the Black Canyon district, 30 miles from Mayer, from D. Care of Bisbee and L. Erikson of Congress. Contracts for $3000 worth of development work have been let. Mr. Wright will superintend the opening up of the property.

The McCabe Extension Co. at McCabe has installed a new engine and dynamo to increase the number of electric drills and to light the town. Light contracts have, it is claimed, been made covering the expense of running the plant. A new steam hoist has been placed on shaft No. 3. Ore shipments will be made from the property as soon as tests under way determine the very best process of treatment.

L. D. Phillips of Douglas, Lacey & Co. has bonded the Perry and Elk mines, near Prescott, from C. Capelli. The Perry is an old mine and has produced a large amount of silver ore.

D. Jones, who has bonded the Yarnell mine at Octave, has struck within 20 feet of the old workings 2 feet of ore that pays $40 per ton.

CALIFORNIA.

AMADOR COUNTY.

The Amador Reduction Works at Jackson are being fitted up with a fuel oil burning plant and will start in roasting sulphurets some time in March. T. N. Smith, formerly Supt. of the Utica mine chlorination works, is Supt.

Work on the new 20-stamp mill of the Keystone mine at Amador is nearing completion. It is to be run by electric power. The 300 H. P. compressor has been started and tested out satisfactorily.

At the Bunker Hill mine the work on the 1400 station has been completed and a crosscut driven to the vein. Drifts are now being extended north and south on this level.

It is reported that in the Kennedy mine the large ore bodies are now being developed on the 2300-foot level, which equal in extent anything before developed on the mother lode. For some months the company has been running the entire mill on this ore body, which is 80 feet in width. It is stated to be the intention of the company to erect a new 60 or 80-stamp mill in the spring, also a hoisting works for the East shaft, where the new mill is to be located.

V. S. Garbarini has been working for several weeks past on the plans for the new hoisting works to be erected over the east shaft at the Kennedy mine, at Sutter Creek. This hoist will be of 100 H. P. and capable of sinking 5000 feet. Five-ton skips are under consideration to run at high speed. The construction of the hoist will probably be started as soon as the plans are completed and approved. It is said that the work will be done by day labor, with V. S. Garbarini in charge.

The mill at the Zeile mine, at Jackson, has been started up again after a shut down of two months. A large force of miners have been put to work.

BUTTE COUNTY.

A contest is on in the Butte County Court, entitled Goodall Estate vs. W. P. Lynch, over the right of the Lynch Co. to run the tailings from their mine upon the Morris Ravine property, which belongs to the Goodall estate, and rework them there. After running these tailings onto the Morris Ravine property, the Lynch Co. attempted to work the tailings, to which plaintiff objects and claims that when these tailings are run onto their ground it becomes their property, and that, if there is any gold in the tailings, it also belongs to them.

CALAVERAS COUNTY.

The Etna gravel mine, situated near Angels, idle for the past five years, is now to be unwatered by the owners, J. Pierano and R. Lemue, of Angels. The shaft is 230 feet deep, with about 195 feet of water in it. At the 200 level is a 500-foot drift.

DEL NORTE COUNTY.

Mr. McCarthy of San Francisco and formerly of Keswick, Shasta county, has bonded for one year at $70,000 sixteen copper claims from Jackson, Davis, Baker, Ray and Diedrick on Diamond creek, near Waldo, Or. He proposes to start development work the first of April.

KERN COUNTY.

G. W. Lloyd has started his new mill on the Phœnix mine, Johannesburg.

LOS ANGELES COUNTY.

T. W. Brooks of Pomona has located several claims on discoveries of orthoclase which he proposes to exploit to provide the basis of a potasslum salts industry.

MARIPOSA COUNTY.

The Figel-Grimm M. & M. Co. has been incorporated in Stockton, to develop copper mines on the company's land in the vicinity of Whiterock. The land is the C. K. Myers 160-acre tract, which was bought in at tax sale by E. P. Figel.

NEVADA COUNTY.

The mill building of the Crystal Lakes M. Co. at Meadow Lake, near Cisco, was blown down in a wind storm. The stamps and batteries escaped damage, but the minor machinery is more or less injured. The building will be rebuilt in the spring.

The Reward mine, at Nevada City, has been sold to the Gold Tunnel Co. G. Levinsky, president of the Gold Tunnel Co., states that it is the intention of the company to remove the Reward machinery to the shaft of the California mine, which the company owns. Through this shaft the Gold Tunnel and Reward claims can be worked to advantage.

PLACER COUNTY.

The limestone quarry on Bear river, near Colfax, is to be utilized for manufacturing lime. The H. T. Holmes Co. of San Francisco has bought the quarry and is preparing to install a patent lime kiln, with a capacity of twenty tons per day.

SAN BENITO COUNTY.

A company composed of San Jose, San Benito and San Francisco people, headed by T. Flint of San Juan, Treadwell Bros. of San Francisco and H. R. Bradford of San Jose is preparing to open and develop the Cerro Bonita quicksilver mines belonging to the Flint estate.

SAN BERNARDINO COUNTY.

J. McGrath is said to have struck a body of ore in a mine near the Brooklyn at Dale.

Castainy, Laprairie & Ganchou are taking out some very rich ore from the Bon Ton mine. This is the only one of the old placer claims that is being worked. The ore of Dale district is, as a general thing, very base.

SHASTA COUNTY.

The new mill of the Mount Shasta G. M. Co. at the Mount Shasta mine on Clear creek, near Shasta, is expected to be crushing ore by April 1st. A. S. Gabbs is Supt.

SISKIYOU COUNTY.

A carload of cyanide vats and apparatus is en route to C. F. Richards at Oro Fino.

J. Hubbard, W. Quigley and others intend putting in a wing dam above Oak Bar, at Klamath river, as soon as the stream gets down lower, to work the river bed.

J. Crawford of Etna, who recently bought the Silva placer mine on Patterson creek, has rigged it up with a hydraulic plant and is running with a full head of water for the spring season.

G. Henderson of Fort Jones has recently bonded the Trace quartz mine, in Vason gulch, from J. Lewis, and has men employed developing it.

H. J. Barton of Yreka and associates are projecting the construction of a ditch from Beaver creek down the Klamath river for a distance of 10 miles, to work several high bars of placer ground. The ditch is to carry about 5000 inches of water, and is estimated will cost about $40,000. A hydraulic mining plant and pipe lines will be installed.

Newkirk & Co. of Detroit, Mich., are getting down to bedrock in their claim at Buckeye Bar, near Yreka, with a hydraulic elevator.

The Siskiyou Hydraulic M. Co. of Paris, France, F. Beaudry manager, operating at Callahans, is now running eleven giants, with about sixty men employed.

F. Talbot has taken an eighteen ounce nugget from his claim at Slug gulch, a tributary of Cherry creek, near Yreka.

The Punch Creek mine at Humbug, owned by Yreka people, has commenced operations again.

W. Long, foreman of the Salmon River Co.'s mines at Sawyers Bar and Summerville, started the giants on the Summerville property on the 12th inst. Mr. Long states that the plant at Sawyers Bar is running steadily day and night, and that if everything is favorable this season will finish working off all of the pay gravel where the plant is now situated.

A. Colburn is drifting on Colburn Bros. mine, near Cecilville, prospecting preparatory to the hydraulic mining of it. The claim prospects run from $3500 to $10,000 per acre. They intend to bring in a ditch from Cecil creek and install a pipe and giant on the property.

TRINITY COUNTY.

C. Scranton, formerly Supt. of the Maple Creek M. Co., has bonded until June 1 the Carr, Sheridan and Post claims, situated on the Trinity river above Junction City. Mr. Scranton represents J. R. Guilph-Norman & Co. of San Francisco. If the company takes the property, an electric power plant is projected to raise water from the river for mining purposes.

W. Clements reports the Gold Dollar hydraulic mine, on Canyon creek, near Dedrick, owned by Gilzean, Davis & O'Neil, as running one giant from a reservoir. The gravel is a high bar, the gold coarse and easily saved. The bank runs from 20 to 50 feet in height and is nearly all gravel. The water is carried from the reservoir to the mine in a 15-inch pipe under a 150-foot pressure. Considerable coarse gold, ranging in pieces of $1 to $20, have already been found on the bedrock. The character of the gravel, it is stated, resembles that of the Sweepstake mine, near Weaverville.

Supt. McCoy has begun work on the ditch tunnel from Garden gulch to Munger gulch for the Sweepstake Co. Cars and other working materials are on the ground. The tunnel will be about 1200 feet in length.

It is reported that the Americas G. M. & M. Co., developing the Hall property at Hall City, has struck ore in its crosscut on the Providence claim. The crosscut has been driven 340 feet to the vein and the strike is reported to be the best so far made on the property. It is anticipated that it will result in the erection of a 10-stamp mill in the spring. Development work has been in charge of W. T. G. Polk.

TUOLUMNE COUNTY.

A company composed of fifteen Sonora and Carters people, with J. L. Gibbs of the latter place as secretary and treasurer, are running a tunnel at Arrastraville to tap an old river channel. The tunnel is now in about 100 feet, and it is expected that 1000 feet will have to be run before striking the pay gravel.

Fine ore is reported struck in the main tunnel of the Riverside mine, on the north slope of the Stanislaus river near Columbia. It is being operated under bond by DeHaven & Co.

The Ferris placer claim, at Yankee Hill, out of which was recently taken a $2300 nugget, is being steadily worked.

COLORADO.

CLEAR CREEK COUNTY.

The Champion and Specie Payment mines, at Idaho Springs, are to be consolidated and both worked through the shaft of the Champion. The shaft of the Champion is down to about 1000 feet and is only 200 feet from the Specie Payment line. By crosscutting, the latter will be opened at about 500 feet below the present depth. In the Specie Payment the smelting streak is from 18 inches to 2 feet, and runs over $80 a ton. With it is fully 10 feet of mill ore that is netting $7 a ton on the plates. The company has bought the Donaldson mill, which belonged to the owners of the Champion.

The Buckeye Tun. & M. Co., a new organization, will soon commence active operations near Georgetown. G. Warner of Denver is vice-president and manager of the company, and L. D. Timmons, also of Denver, is secretary and treasurer; O. Shepard is Supt. The properties of the company lie on Democrat mountain and consist of the Buckeye State, Edward VII, Crown, Buckeye Extension, Refuge, Emida and Ellabelle lode claims, together with the Buckeye tunnel site.

The Mineral Chief group, at Georgetown, has been bought from the R. O. Old estate by the Linn Con. M. Co., which has been operating in the district on some property owned by it on Republican mountain, adjacent to the Mineral Chief. W. C. Hood is manager and F. A. Maxwell treasurer, at Georgetown.

F. A. Maxwell has sold his Mendota mill at Georgetown to the Old estate. The mill was erected several years ago for the purpose of treating the Mendota dump. It is estimated that there are many thousands of dollars' worth of ore in this dump, and now that the mill and mine are under the same management, arrangements will be made to treat it on a larger scale.

Despite difficulties from intense cold, that freeze the source of water supply to the extent of almost stopping the flow in the creeks of the vicinity during the fore

part of February, the Empire tunnel, at Empire, was driven 94 feet in twenty rounds during that month. With the number of drills used and men employed, this makes the cost of the bore greatly below that of any similar enterprise in Clear Creek. The main quartz streak, 30 inches wide, has been intersected and found to carry ore of a concentrating grade.

Five men, working five shifts, in the Wisconsin mine at Silver Plume, took out 1142. It cost about $75 to take out the ore, which thus netted $1067.

R. C. Vidlor of the Horseshoe tunnel at Argentine is, it is reported, to immediately install a compressor plant on the tunnel. The tunnel as designed will be from 7000 to 10,000 feet in length.

GILPIN COUNTY.

The Fairfield M. Co. has been incorporated, capital $500,000, to operate the Fairfield mine, near Russell. Delaware and Maryland people are to be the operators. The property has been owned by E. W. Williams of Denver.

The shipments of ore, tailings and concentrates from the Black Hawk depot for February to the smelters and outside treatment plants were 310 cars, aggregating 5735 tons. In comparison with the same month of 1901 the shipments show an increase of forty-six cars, or 850 tons.

A free-gold strike has been made in the 420-foot level of the East Notaway mine, in Lake district, by J. H. LeMoyne, who is leasing in the mine. The ore shows sylvanite as well as free gold. The property is being worked by the Town Topics Co. under Manager Josephi. A new and more powerful hoisting plant is to be installed during the next sixty days.

LAKE COUNTY.

The lessees on the A. Y. and Minnie mine, at Leadville, have recently made a shipment of 200 tons zinc-lead ore to the A. M. W. mill for the purpose of testing it. The character of the A. Y. and Minnie zinc ore is somewhat different from that of the Adams, and by running it over the A. M. W. tables the lessees can ascertain just what sort of a concentrate can be obtained. Until it can be ascertained just what can be done with the low-grade Minnie ore, no move will be made to remodel the Minnie mill.

PARK COUNTY.

A. B. Davidson, F. Clark and G. H. Nero have taken a two-year lease on the Jim Blaine mine, in Buckskin, from J. Moynahan of Alma. The property carries gold, silver and copper. It is the intention to work the property for the shipping ores.

SAN JUAN COUNTY.

The Irene mine, near Silverton, owned by C. S. Casad, has been a small shipper for several seasons. Late last fall Mr. Casad let a 100-foot contract to drift on the vein. On this contract an ore shoot has been opened that runs 624 ounces silver per ton, with small values in gold.

The Notaway M. Co. at Silverton has just completed connecting a new set of electric drills in the lower or Thunder tunnel. The holes are being driven about 35 feet to the shift. The company proposes to build a tramway from the mouth of the Thunder tunnel to the railroad track and all the ore will be loaded automatically into the cars. The different tunnels will be connected by shafts or upraises and all ore will be shipped through the lower tunnel.

TELLER COUNTY.

Peterson & Stone, who made a strike on the Laura Lee, on Mineral hill, at Cripple Creek, in a drift from the 100-foot level, have been sinking and raising on the ore. In the upraise the ore widened out to 2 feet. The gold is free and is in wires, chunks and splotches. The property is now being developed with a horse whim, but a steam hoisting plant is to be installed, with possibly a compressor and air drills.

IDAHO.

ADA COUNTY.

J. W. Burton of Salt Lake City, Utah, who owns in the Ella Hill group at Neal, says there are nineteen stamps distributed among five small mills operating at Neal. The greatest depth of workings is on the Daisy, 370 feet. The owners have equipped it with a 5-stamp mill and are taking from the plates $10 gold per ton and saving concentrates that go from $100 to $350 per ton. An equally good showing is made at the Homestake mine, adjoining.

BLAINE COUNTY.

W. H. Dowe of New York and F. M. Stone of San Francisco have been examining the projected mining operations in the Wood river country, near Hailey, by H. L. Hollister. They state that a company to be called the Idaho Con. G. M. Co. would be incorporated to operate the enterprise, and that it would be a close corporation with probably no more than fifteen stockholders. Mr. Dowe states that 100 stamps would be in operation within four months. The mines owned by the company are the Crœsus and Crœsus Extension, the Hattie, the Big Camas, the Bird group and the Montana group. The Crœsus, Big Camas, Hattie and Golden Star all have bodies of ore opened up. On the Crœsus there is a 10-stamp mill. This will be replaced by a 40-stamp mill. On the Hattie a 20-stamp mill has been erected. The Golden Star has a new mill of twenty stamps. On the Big Camas a 40-stamp mill is being erected. Power for all of these is to be taken from Shoshone falls in the Snake river. J. J. Blow, formerly of Leadville, Colo., is Supt.

IDAHO COUNTY.

G. W. Armour, lately from Thunder Mountain district, says that there is a widespread area, all of which is gold bearing, and yet there is no quartz and no trace of any other than volcanic rocks. There has been and still is a mistaken notion relative to Thundor Mountain that it is a mining region of extremely rich ore. In point of fact, it is destined to be a great low-grade camp. But there are some advantages connected with it. First, there will be no waste from mining operations. The ore cannot be sorted, as rich and poor ore look alike. It is soft and easily worked; a stamp that will work two and two and a half tons of ordinary ore will work six and seven tons of this. The mining will largely be done in open cuts, and including milling, when a large plant is put in, the total expense should not exceed 60 cents a ton.

KOOTENAI COUNTY.

The Richmond G. M. & M. Co. at Tyson is driving a tunnel, now in 150 feet. It is expected that the Richmond ledge will be reached in 60 feet additional. The tunnel will then be continued until it reaches the War Eagle ledge. The success of the development made will, it is said, insure the early establishment of a mill.

LEMHI COUNTY.

R. M. Edwards and J. P. Rice, of Houghton, Mich, have organized a company under the laws of New Jersey to develop the Kittie Burton claims, near Salmon City. New York and Houghton capitalists are interested.

OWYHEE COUNTY.

The DeLamar mine of DeLamar, situated at an altitude of 6500 feet, was located by J. Wilson and sold to Capt. DeLamar in 1887. He sold the mine to the DeLamar M. Co., Ltd., in 1890. The mine has sixteen levels, two of which—four and eight—are adits from the surface. The extreme length of No. 4 is 2505 feet and of No. 8 to incline 2130 feet and to end 3080 feet. During Capt. DeLamar's time the output was $2,000,000, the expense $1,000,000. Under the DeLamar M. Co., Ltd., control, the output has been $7,723,926, expense $4,513,388, making a clear profit of $4,210,538. To solve an important question, a tunnel—the Mill tunnel—7½x7½ feet, was started, and on Sept. 1, 1899, the tunnel was in 250 feet; from this date to Dec. 22, 1900, and from May 6, 1901, to June 3, 1901, total 477 days, the tunnel was advanced 5667 feet, taking out 48,500 cars of waste. The average daily advance was 11.9 feet. No deductions were made for holidays or lost time. Men employed, twenty-one to twenty-nine; average, twenty-six. Powder used, 55,750 pounds No. 2 Hercules; fuse, 160,900 feet; caps, 22,600; candles, 200 boxes. Two machine drills were employed. The rock was hauled out by mules in trains of six 1400-pound cars. From start, Sept. 1, 1899, to March 31, 1900, 212 days' run in hard basalt made an advance of 2720 feet, or nearly 13 feet per day. December, 1899, thirty days' run in hard basalt was 436 feet, an average of 14½ feet per day. The tunnel construction was in charge of general Supt. T. Davey, under Manager D. B. Huntley, who preceded the present general manager, E. V. Orford.

SHOSHONE COUNTY.

Suit to quiet title to the Crown Point lode mining claim at Yreka has been commenced in the United States District Court by the Cœur d'Alene Development Co. against P. Flynn and J. F. McCarthy.

WASHINGTON COUNTY.

L. Rosenzweig, representing C. Reed of Erie, Pa., the owner of the Iron Dyke mine in the Seven Devils district, and the Northwest Railroad, has, with Manager F. E. Pearce, made an inspection of the mine. Mr. Rosenzweig announces that the work of prospecting and developing the mine will be pushed from now on. It is understood to mean that the railroad will be completed at an early date.

MICHIGAN.

HOUGHTON COUNTY.

President Stanton of the Baltic Copper M. Co. at Houghton says in his annual report that the anticipations expressed in former reports of a gradual increase in the average yield of the rock treated, as openings should be extended, have been realized, the returns showing an average yield per ton of rock stamped of 23 pounds of ingot copper, against 19 58 pounds in 1900, and 17 pounds in the six months' stamping in 1899. Details of expenditure given in the report show: Rock stamped, 114,703 tons; product of mineral, 3,564,670 pounds; product of refined copper, 2,641,432 pounds; yield of rock stamped, 23 pounds per ton, or 1.15%.

MONTANA.

The receipts of gold at the United States assay office at Helena for each month show an increase over those for the corresponding month of last year. Those for February, 1902, were $130,314 41, an increase of about $10,000 over those for February, 1901. The receipts of gold in February, 1902, were 8,913 47 ounces, compared with 8,478 33 ounces in February, 1901. This total was divided as follows: Montana, $86,236.97; Idaho, $18,052 42; British Columbia, $17,596.46; other States, $8,428.56 Of the receipts from Montana, Lewis and Clarke county contributed $40,846.06; Park, $17,586 07; Madison, $14,415.70; Fergus, $8,081.94.

BROADWATER COUNTY.

F. D. Miracle, who owns a controlling interest in the Frieberg mine, near Winston, has bonded it to Whitehead Bros. and J. Newell. The property is developed by two tunnels on the lead, one of 800 feet and the other 600 feet. The bonders propose to work ahead on the upper tunnel, which is on the lead 600 feet.

CASCADE COUNTY.

The American S. & R. Co., it is reported, has decided to spend a quarter of a million dollars in remodeling the old silver smelter at Great Falls. This work is to be done at once and is to be completed this summer. It is understood the company intends making this one of the chief smelters in the West and will make a direct bid for the ores of the Cœur d'Alenes, as well as those of the camps on both sides of the international boundary line, which the Great Falls & Canada and Great Northern branches reach.

At the refinery of the B. & M. smelter at Great Falls the world's record for day's output of copper ingots was broken by 19,000 pounds. The previous record for the world was held by the Great Falls smelter at 71,000 pounds of ingots. The new record is 90,000 pounds of copper in ingots.

CHOTEAU COUNTY.

A discovery has been made at Highwood of an extensive deposit of sapphires. The stones when cut have a brilliant color like that of the Yogo variety, but more smoky.

FERGUS COUNTY.

Considerable development work is being done on the Philippine group at the head of Armells creek, near Kendall, by C. A. Case, who states that ore taken from the prospects ran from a trace to $3.60 in gold. A stratum of volcanic cinders has been encountered, which runs from $1.20 to $2.10 in gold per ton. The ore is suitable for treatment by the cyanide process.

FLATHEAD COUNTY.

The West Fisher G. M. Co. of Libby, J. Brannagan manager, has let a contract for a 100-foot extension of the tunnel on its Last Chance mine in the West Fisher district at $12 a foot. The tunnel is now 100 feet long and at the face the ledge is 13½ feet wide. It is reported that the company will install a 10-stamp mill plant in the spring.

GRANITE COUNTY.

T. L. Wall of Preston, S. D., representing the Deadwood Smelting Co., and P. C Waite, the cyanide expert of Bozeman, have made an examination of the Mountain Ram group, near Phillipsburg, owned by S. F. King and J. A. Murray of Butte. Considerable development work has been done and a large body of cyaniding ore has been exposed on the various levels. The Deadwood Smelting Co. is expected to install a cyanide plant and at once begin the operation of the mine.

The Rock Creek M. Co., which proposes to mine gems and precious stones, cut and sell them at wholesale and retail, has been incorporated, with office at Bimetallic, and capital $200,000, by C. D. McLure, A. B. Ewing, M. Rumsey and H. S. Rumsey of St. Louis, Mo., P. A. Fusz of Granite and F. D. Brown of Phillipsburg.

MADISON COUNTY.

At the Lester mine, near Pony, the strike of a new lead of free gold ore is reported. The owners, Armour & Jeffrey, are getting out a carload of this ore for shipment. The principal ore bodies of the Lester are in a large low grade vein of cyaniding ore. No plant for their reduction has been constructed.

The South Boulder M. Co., operating mines on the south slope of Hollow Top mountain, near Pony, has completed a two months' test run of ore in its new 10-stamp mill, and it is understood the saving on the plates, followed by concentration, was very close. The mill has been closed down until the water power can be used.

The Butte & Potosi M. Co. have driven a crosscut tunnel 110 feet, tapping the ledge in the mine, near Pony, 100 feet down. At this point 9 feet of steel galena has been opened, carrying 60% lead, $48 in gold and twelve ounces silver. It is reported that the company will erect a 100-ton concentrator in the spring.

C. E. Damours of Virginia City has been developing a ledge of gold ore in the Summit district. He expects to put a plant on it this summer.

PARK COUNTY.

The National Park G. M. Co. has been incorporated in Great Falls by D. Noble of Cooke City and associates with capital of $100,000. The office will be at Great Falls and the company will operate the Little Pittsburg, the Noble, the Triangle, the Silver Fraction and the Money King claims, near Cooke City.

SILVER BOW COUNTY.

The Miners' Union claim at Butte has been bonded to F. A. Heinze for $150,000. The property is owned by G. W. Stapleton, J. Noyes, P. J. Brophy, G. H. Casey and Josephine M. Lyons. It is said to be Mr. Heinze's intention to work the ground through the Cora mine, adjoining, on which he has sunk a 1000-foot shaft.

NEVADA.

ESMERALDA COUNTY.

Durkee, Gardner and Fearoy, the committee sent from New York to examine the mines in Hawthorne district recently bought by the Con. Esmeralda Mines Co., after spending several days at the mines, indicate that the work of bringing in water from Cottonwood canyon and the building of a mill near the mines will soon begin. J. A. Yerington of Carson City is manager for the company.

LYON COUNTY.

W. D. Davidson and J. Z. Lockwood, who have been operating a claim near Cambridge, claim to have a fine showing of ore that yields well to cyaniding, some of the assays going as high as $42 per ton. A contract has already been let for the running of a 100-foot tunnel.

NYE COUNTY.

The following directors have been elected in the Gold Hill M. Co. in Tonopah: J. L. Butler, W. Brougher, C. Brougher, J. W. McCulloch and T. L. Oddie. The officers elected are: J. L. Butler president and T. L. Oddie secretary.

The Ohio-Tonopah M. Co. has been incorporated in Youngstown, Ohio, with F. H. Schmidt president and C. S. Cook secretary and treasurer, both of Youngstown, and S. A. Knapp manager at Tonopah. The company's property comprises five claims extending west and southwest and covering the line of extension of the Mizpah, Burro and other principal ledges of the main developed group. The present shaft is 90 feet deep, and it is the intention to cut the shaft out to two compartments, put in a hoist and sink through the surface porphyry here estimated to be about 400 feet thick, into the lode bearing porphyry which underlies it.

The New York G. M. Co. has been incorporated in Salt Lake City, Utah, capital $37,500, with G. A. Land as president and E. L. Hall treasurer and secretary. The company owns three mining claims at Tonopah.

WASHOE COUNTY.

The Monte Carlo mine, near Reno, has been bonded to San Francisco people at $15,000, some cash down. The ledge is well defined and carries gold, silver, lead and copper.

The Jokor, Go Down, Aurora and Barstow claims at Granite hill, near Rono, have been sold to E. Kane and B. Duncan by T. H. Deegan, H. Anderson, M. Gotisola, J. Kellock and J. A. McDonald. These properties have been good shippers for the past two years.

A new strike has been made in the Wedekind mine, near Reno. At a depth of 27 feet, in a new shaft, 5 feet of ore, running, it is stated, over $2000 a ton, has been encountered. A second shaft has been started 100 feet away on the trend of the formation and at 6 feet depth picked up the lead, 4½ feet wide and assaying $3380. The ore is gray silver chloride and sulphide of silver. It is very heavy and carries a little antimony. There is from ten to twenty ounces of gold in the rock. The mine is owned by J. Sparks of Reno.

WHITE PINE COUNTY.

At the annual meeting of the Rocco-Homestake Nevada M. Co. of Hamilton, held in San Francisco on the 27th ult., O. J. Smith was elected president and M. Bernard secretary. The company bought from B. L. Smith and H. A. Jackson the Rocco, adjoining the Homestake on the north, and Rocco No. 2 mine, adjoining the Rocco on the east, and also the

Mother Ledge claim. The company has also made arrangements to buy from the present owners of record all of the Last Chance mine, adjoining the Homestake on the west.

NEW MEXICO.

GRANT COUNTY.

The two principal turquoise operators in the Burros mountains, near Burros, at present are the Azure Co., owning fourteen claims and employing fifteen men steadily, and the Gem Turquoise & Copper Co., owning fourteen claims. Both companies are said to be shipping large quantities of stones to Eastern markets. The Porterfield Bros. are also working a few men on their five claims.

The Faywood Lead Co. has been organized under the laws of the State of Delaware, with a capital stock of $100,000. The company will operate a silver-lead property located in what is known as Cook's Peak district, and about 20 miles from Faywood, a station on the Santa Fe road. Preparations have begun for the erection of a concentrating plant upon this property. The officers of the company are: A. P. Nevin president and E. F. Thieler treasurer.

SANTA FE COUNTY.

H. Grant says that the contract to move the dredger on the Chama river from the place where the flood drifted it to its former place has been let to S. C. Battleson. The dredger will be taken apart and carried overland. A company has been organized with $120,000 capital to work the dredger on the Chama placers.

SOCORRO COUNTY.

The Grapevine Lead Co., with a capitalization of $100,000, has been organized under the laws of Delaware to operate a silver-lead property near Lava, Socorro, New Mexico, in the San Andreas mountains. A 70-ton concentrating mill, using dry concentration, is being erected. The officers of the company are R. C. Ely president and J. Minot treasurer, of New York.

OREGON.

GRANT COUNTY.

The last payment on the Oro Fino mine, near Alamo, has been made by Glass & Witherop of Spokane, Wash., who held the property under bond. A mill test is about to be made to determine the average value of the ore and to indicate the best method of treatment. The mill test heretofore made at the Red Boy mill ran $80 per ton in free gold alone.

JACKSON COUNTY.

Drilling machinery is being installed by the Southern Pacific Co. at its coal mine near Medford. The drill will be used in testing the coal vein in different places on Roxy Ann mountain. A tunnel has been run 120 feet in the mountain, developing a good quality of coal in a vein too small to supply a large consumption. The company has bonded a number of tracts of land and will make a thorough test in order to develop the vein at a wide point. The coal is claimed to be of excellent quality.

T. Sutton and F. Reese have sold their Roaring Gimlet mining properties on Kane creek, near Gold Hill, to W. Baisley, of Trustee, Indiana, and W. Mendenhall, of Richmond, Indiana, representatives of an Eastern company, for $10,000. This property consists of three claims. The greatest depth of present workings is 90 feet. Messrs. Sutton & Reese bought the properties about one year ago of Messrs. J. J. Houck and J. H. Mitchell for $3000. Since obtaining possession they have mortared and milled about $10,000. It is locally reported that the recent purchaser will have a steam hoist and pump erected in the near future to better facilitate the present mode of operation.

JOSEPHINE COUNTY.

T. W. Morgan-Draper of the Waldo S. & M. Co., at Waldo, has let contracts for the No. 1 Lyttle tunnel, which is to be 500 feet long, 6 feet 6 inches high; 4 feet 6 inches wide bottom and 3 feet 6 inches wide at top; and No. 2 Cow Boy tunnel, which is to be 600 feet long, 6 feet 6 inches wide at bottom and 3 feet 6 inches wide at top. The company will this summer install a smelting plant of large capacity.

W. H. Hamlin has sold eight acres of land on Rogue river, near Grants Pass, to a mining company operating in the Dry Diggings district. The company proposes to dam Rogue river near the point where they have bought this land and with hydraulic rams raise water from the river to the mining ground.

SOUTH DAKOTA.

CUSTER COUNTY.

(Special Correspondence).—Many mines which have been closed down for the winter are now resuming work and the outlook for successful work is considered good. The Globe mine, with a group of ten claims, has been sold by C. Haserodt and C. Harbach to the Wabash M. Co., of which J. F. Sidey is manager. The consideration is $100,000. Work in the tunnel will be resumed and the sinking of the main shaft continued.

The Saginaw Co. are sinking an incline and prospecting with a diamond drill. Good progress is being made drifting on the vein in the Crown mica mine. F. C. N. Graydon is Supt.

Custer, S. D., March 8.

PENNINGTON COUNTY.

The Imperial Co. has added to its holdings in Blacktail by buying from H. B. Young the Peorla lode claim for $12,000.

The Homestake G. M. Co. at Lead has paid the 280th consecutive monthly dividend. The whole sum now aggregates a total of $10,863,750.

J. Gray, Supt. of Wasp No. 2 at Lead, reports 585 ounces of gold, the product of eleven and one-half days run.

The new Imperial 200-ton cyanide mill of Deadwood started on the 3d inst.

The Spearfish cyanide mill in Johnson gulch will start up on the 10th inst. with 300 tons daily capacity.

UTAH.

BEAVER COUNTY.

The Jayhawker M. Co. has been incorporated to develop a mine near Frisco. P. Ryan is president and E. McGurrin is secretary and treasurer.

The Majestic Co. made another payment of $15,000 on its properties near Milford, making $35,000 paid since the first of the year. The last payment was upon the O. K. and Harrington-Hickory options.

BOX ELDER COUNTY.

The Seasame G. & S. M. Co. has been incorporated in Salt Lake City, capital $30,000, F. T. Wilson president and A. F. Waltz secretary and treasurer. The company owns five mining claims in Park Valley mining district.

IRON COUNTY.

In an article of the issue of February 22, on Stateline, it was stated that it was expected that in the Margaret the main ore shoot would be found on the 150-foot level. That is now reported as having since been done, the vein said to be 4 feet wide, the ore assaying $10 per ton and better.

JUAB COUNTY.

R. D. Grant of Salt Lake City has given an option at $175,000 for six months on the Sioux and Utah groups of mines at Tintic to J. A. Underwood, Supt. of the Carisa M. Co. at Tintic. The territory embraced consists of thirteen patented locations and in former years has been productive.

PIUTE COUNTY.

The Madsen M. & M. Co. at Kimberly will, it is reported, soon commence the building of a long flume, several miles of road and the erection of a mill and power plant for the Trapper's Pride mine. A. D. McLean is Supt.

SALT LAKE COUNTY.

T. Jacobson, manager of the Columbus mine at Alta, says the mine will be provided with a concentrator the present season. He has, he says, now blocked out for such a plant 4000 tons of ore that will go $18 per ton in silver, lead, copper and gold. He is shipping ores to the smelter that shows 35% lead, twenty ounces silver, 3% copper and $1.50 gold per ton.

SEVIER COUNTY.

The L. & N. group of mining claims, near Marysvale, owned by L. Wilson, H. N. Hayes and W. C. B. Twock of Richfield, are said to be showing 70 feet of ore. The shaft, now down 50 feet, is in ore which assays, it is said, over $13 in gold and thirty-six ounces in silver.

SUMMIT COUNTY.

Operations at the Bogan mine at Park City have ceased and the pumps have been drawn. Manager Spiro says the company has reached that point where the equipment is inadequate to the task of operating economically. A greater steam making capacity, a compressor and power drill plant are required. After the spring breakup, when the roads are again in good condition, the company will get the additional equipment required and operations will again be resumed.

J. Farrell, president of the Quincy M. Co. at Park City, says there are about 3000 persons upon the payrolls of Park City mines and about $270,000 is distributed monthly in wages. From the mines is now coming, says Mr. Farrell, an average of 450 tons of ore daily. The camp is without an idle tenement or vacant storeroom and preparations are being made to erect many new structures.

TOOELE COUNTY.

The superintendent of the Con. Mercur tailings mill at Manning has emptied its leaching tanks, converted their contents into gold bullion and closed down until the warm sun of April renders it possible to start up again. Cold weather has made it difficult to handle the tailings. It is said that the plant has been adding from $400 to $600 daily—according to the auriferous contents of the tailings—to the company's earnings.

UTAH COUNTY.

The Granite M. & M. Co. of Santaquin has been incorporated to operate a mine in Utah county, with a capital of $6000, L. Openshaw is president and T. B. Hillis Jr. is secretary.

WASHINGTON.

FERRY COUNTY.

J. L. Harper, Supt. of the Hawkeye mine at Republic, says that the shaft is down 250 feet, showing ore in the bottom of shipping grade. It is expected that the ore will be treated at the Granby smelter at Grand Forks.

WHITMAN COUNTY.

Whitman county may have gold mines if the opinion of C. L. Craig, a miner from the Black Hills, is correct. Craig claims he has discovered on J. P. Crawford's farm croppings of ledges which show gold and silver. He has made a contract with the Crawfords to prospect the find for four months.

FOREIGN.

BRITISH COLUMBIA.

In the Bridge river gold bearing section of Lillooet district it is proposed to work the ores by arrastras. Very good results so far have been secured by those who have hitherto adopted that method. Many mine owners have concluded that the best plan at present is to use the material on the ground, build arrastras, and for each man to prove his own claim. In this way good wages can often be made.

The Hastings (B. C.) Exploration syndicate has declared a dividend of 5%. The company owns the Arlington mine near Erie. The ore values consist chiefly of gold and the property comprises eleven claims, of which only one has been systematically worked.

The Cascade mine, near Rossland, may be equipped with a concentrating plant of 75 to 100 tons daily capacity in the near future according to E. W. Thomas, the Philadelphia, Pa., agent who is connected with the property. The proposal is to erect a concentrator to handle Cascade and Bonanza ores, the company first to open up the ore bodies until from 25,000 to 30,000 tons of ore is blocked out. Concentration tests have been made of Cascade ore and it is found to concentrate about ten into one.

H. P. Jackson, manager of the Contact mines, in Burnt Basin, near Gladstone, says the mine embraces the Mother Lode group, which carries gold and silver exclusively in an ore well suited for concentrating. It is the intention to equip the property with a tramway and mill, but whether this will be done by the present company or not will be determined by circumstances. The mill will be located near the railroad and an aerial tramway to the mine can be constructed for some $4000, after which the ore could be delivered from mine to mill at a few cents per ton for transportation. The tests made show that the ore will concentrate almost ten to one.

M. H. Gilliam of the Bayonne mine, situated in the Kootenay district, near the boundary, has a tunnel started. The ore is free milling. The mine is under bond to Spokane people, who intend to test the property thoroughly. The operation of the mine would require the erection of a stamp mill and the construction of about 25 miles of road.

Work has been resumed on the White Bear mine at Rossland and it is stated that the main shaft will be sunk deeper. A new gallows frame has been erected at the shaft house and other preparations made with a view to extensive operations. Supt. Demuth states that with one power drill the crew of twelve men made 90 feet of sinking in the shaft during February. He claims that the distance thus made in the short month of the year is the record in the history of the Rossland camp.

MEXICO.

The production of silver from Mexican mines during the last three fiscal years is as follows:

	Kilograms.	Value.
1898–1899	1,417,216	$57,985,400.58
1899–1900	1,444,621	59,106,694.50
1900–1901	1,521,865	62,267,123.70

The kilogram of silver is calculated at the Mexican mint value of $40.915.

The production of copper exported during the same three fiscal years is as follows:

	Tons.	Value.
1898–1899	16,720	$4,135,613
1899–1900	28,071	9,863,902
1900–1901	32,470	11,067,538

It is stated that copper matte can be produced in Mexico in ingots at a cost of from 4 to 6 cents Mexican a pound.

The Veta Grande Copper Co. are pushing development work at their property about 40 miles northwest from Hermosillo, Sonora. They have opened up a new ledge from 15 to 25 feet in width, the ores carrying free visible gold and a high per cent of copper.

F. S. Bagley, secretary of the Mimbres C. Co. of Denver, Colo., has made the final payment of $10,000 upon the Mimbres copper mine, near La Barranca, Sonora.

L. Ginger of the Gold Coin Prospecting & Dev. Co., with Goodall Bros. of Boston, Mass., have been at San Javier, Sonora, examining the Santa Rosa mine which they had bonded.

The Carmen mine at Los Bronces, owned by A. Porchas and C. C. Rountree of La Colorada, has shipped 83 tons of ore which produced, it is stated, more than 20,000 ounces of silver. The ledge is 4 feet wide and averages 80 ounces per ton in silver. A. Porchas is Supt.

TRANSVAAL.

The gold output on the Witwatersrand during February is estimated at 81,405 ounces. This compares with an ascertained output of 70,340 ounces fine gold in January, of 52,897 in December and 39,095 in November.

YUKON TERRITORY.

The miners of the Klondike, indignant at the treatment they have received from the Dominion Government's Department of the Interior, have appealed to the Earl of Minto, Governor General, for the cancellation of the agreement of the Treadgold concession. A petition signed by 3000 business men of Dawson and gold mining operators from the creeks has been sent by special messenger and a committee to Ottawa. The attention of the Governor General himself and Sir Wilfred Laurier will also be brought to it, and by this means the miners hope to obtain redress from the encroachments of the English company that would monopolize their water supply. If an absolute reversal of the order cannot be effected the Dawson delegation will seek a reprisal by tying the company down to the narrowest limits.

An important find has been made on French hill, near Hunker creek. In bench claims large deposits of cassiterite, stream tin ore and pebbles have been found. The ore also carries gold values. The discovery has been made on a half dozen different properties.

The newest quartz deposit in the Klondike to be operated this season will be the Lone Star, owned by Americans, who have a large stamp mill erected. Dawson miners who have been last in the camp say that there will be a large development in quartz mining this year.

Commercial Paragraphs.

THE Stirling Co. is installing 600 H. P. of their water tube safety boilers at the Standard mine, Wallace, Idaho.

EUGENE DIETZGEN & CO., manufacturers of engineering instruments, drawing materials, etc., of Chicago, Ill., have opened a San Francisco store with Joseph Dannheiser as manager. The San Francisco store will carry a full line of the company's goods. It is located at 508 Market street.

THE Hendrie & Bolthoff Manufacturing & Supply Co., Denver, Colo., have purchased the Sheridan building, near the Union Depot in that city, which they will fully occupy in the near future. This building covers a large area and has four floors and basement, giving ampler room for this company's increasing stock of mine and mill equipment. Their several warehouses will continue to be utilized as usual.

THE latest series of new catalogues mentioned some time ago as being issued by the American Engineering Works, Chicago, covers perforated metal screens, mine cars, gable cars and ladle cars. The company make a great variety of wheel and axle equipment suited to every service, large special cars and light cars, as well as their standard heavy car. They add that their screen shops have unlimited capacity in fine mill screens and are actively shipping.

THE General Concentrates Co. is erecting a 70-ton dry concentrating plant at Lava, N. M., for the Grapevine Lead Co., and has just made a shipment of four carloads of machinery to that point. The plant will be equipped with a 9″x15″ Buchanan jaw crusher, 4″x12″ Sturtevant roll jaw crusher, a set of Hooper rolls and a set of Buchanan rolls for fine crushing, five Mashek octagonal revolving screens, and seven Hooper pneumatic concentrators. Power will be furnished by two Hornsby-Akroyd oil engines, 44 H. P. and 50 H. P., respectively.

THE Northern Electrical Manufacturing Co. of Madison, Wis., sends a bulletin describing the Watson type of small mo-

tors and generators, which they have recently placed on the market. These little machines appear to depart in design and construction from other small motors and generators. The frames are cast from electric steel and are multi-polar. The armatures are also built on the same plan as followed in the construction of larger machines. They have slotted laminated cores laid with form-wound coils and arranged for perfect ventilation. In appearance they are neat, compact and symmetrical. The Northern Electrical Mfg. Co. say that at present they are building these in sizes from ½ to 2 H. P.

RECENT orders for the engine type generators of the Crocker-Wheeler Co. have again given assurance of the high regard in which these machines are held by manufacturers. The company has been striving to bring these generators to such standards as will give a wide range of outputs and still maintain speeds that correspond to those chosen by the prominent engine builders. The following companies are reported to have recently placed orders for these machines: Pittsburg Reduction Co., New Kensington, Pa , one size 224, 200 K. W.; National Mining Co., Sygan, Pa., two size 224, 200 K. W.; Lake Shore & Michigan Southern R. R., Collinwood Shops, O., one size 336, 400 K. W.; Federal Lead Co., Alton, Ill., two size 224, 150 K. W.; Farrand Organ Co., Detroit, Mich., one size 111, 100 K. W.; Snellenberg & Co., Philadelphia, Pa., four size 224, 200 K. W., one size 111, 100 K. W.; Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., one size 224, 200 K. W.; American Bridge Co., New York, one size 280, 300 K. W.; Allis-Chalmers Co., Milwaukee, Wis., one size 336, 300 K. W.; Hawley & Hoops, New York, one size 84, 75 K. W.; Hall of Records, New York, two size 252, 150 K. W., one size 224, 100 K. W., one size 67, 50 K. W.

Personal.

ARTHUR L. PEARSE, of London, is in Idaho Springs, Colo.

J. E. BEVERIDGE of Salt Lake City, Utah, is in New York.

G. CORBETT, of Virginia City, Nev., is in Tonopah of that State.

C. E. BUNKER is Supt. Keystone Con. M. Co., Amador City, Cal.

N. B. KNOX of San Francisco is examining mines at Republic, Wash.

GEO. W. GRAYSON has returned from Tuscarora, Nevada, to San Francisco.

A. J. CLARK, a mining man of Denver, Colo., is making a trip to Honolulu, H. I.

FRED S. AND JOS. J. PHEBY have gone to the City of Mexico on mining business.

WILL H. PARRY has resigned as manager the Moran Bros. Co., Seattle, Wash.

PHILLIP MIXSELL of Idaho Springs, Colo., recently returned from New York.

G. R. ERMLICH, an assayer of Durango, Colo., has opened a laboratory in Denver, Colo.

FRANKLIN LEONARD, president Comstock Tunnel Co., is visiting Lyon Co., Nevada.

GEO. T. WADE has been elected president Mill and Smeltermen's Union, Butte, Montana.

J. A. LUSK, Supt. of the Tip Top mine, Hailey, Idaho, is sojourning in Santa Cruz, Cal.

D. KEITH, of Salt Lake City, Utah, has returned to that place from a trip to San Francisco.

SAMUEL BUTLER has been elected president of the Grass Valley, Cal., Miners' Union.

PHILIP MIXSELL, of Idaho Springs, Colo., has returned there from a trip to New York.

R. C. VIDLER has returned to Argentine, Colo., from a several months' sojourn in London.

C. A. STEPHENS has been appointed Supt. of the Gold Road mines, near Kingman, Ariz.

E. S. FEINEMAN, of the Victor M. Co., at Prescott, Ariz., is sojourning in Rochester, N. Y.

H. JOSEPH has been appointed manager of the Silver Shield M. Co., at Bingham, Utah.

S. A. KNAPP, of Hawthorne, Nev., is Supt. of the Ohio-Tonopah M. Co., at Tonopah, Nev.

W. P. SCOTT, of the Black Oak mine, has returned from San Francisco to Tuolumne Co., Cal.

L. J. ROSE, of Oxnard, Cal, manager of the Red Cross mine, at Omega, Cal., is in San Francisco.

P. S. RIDER, General Supt. for the United Rico Mines Co., at Rico, Colo., is in Denver, Colo.

JOSEPH BYE is Supt. of construction of the Lenora mine copper smelter, at Crofton, Vancouver Island, B. C., and Fred Young, formerly of Butte, Mont., is resident engineer.

T. N. SMITH is the new Supt. of the Amador Reduction Works, at Jackson, Amador Co., Cal.

G. A. WANGER, who has been operating the Alexander mine, near Kingman, Ariz., is in Oregon.

J. P. WALLACE, of Kingman, Arizona, was in Denver, Colo., on the 4th inst., having ores tested.

F. H. LATHROP, manager of the Ophir mine, at Stateline, Utah, has returned from Detroit, Mich.

E. GEE has been appointed manager of the Gold King M. Co. mine at Picacho, San Diego Co., Cal.

P. H. MCDERMOTT succeeds W. J. Nelson as general manager Exposed Treasure M. Co., Mojave, Cal.

W. PARENTEAU has been appointed Supt. of the Gould mine, near Nevadaville, Gilpin Co., Colo.

J. F. FORCE, president of the Bobtail Mines Co., is at Ray, Ariz., inspecting the mines of the company.

G. W. LINDLEY, former foreman Tom Thumb mine, is now Supt. Princess Maud mine, Republic, Wash.

EDWIN E. CHASE, mining engineer of Denver, Colo., has gone to Arizona to examine a copper property.

F. S. BAGLEY, of Denver, Colo., is Supt. of the Mimbres copper mine, at La Barranca, Sonora, Mexico.

J. J. BLOW, formerly of Leadville, Colo., is General Supt. of the Idaho Con. G. M. Co., at Hailey, Idaho.

GENERAL MANAGER GEORGE H. DUNHAM of the Chainman mine, Ely, Nevada, has returned from the East.

EDWIN HAYNES is general manager Chicago & Sonora Gold Placer M. Co., Saqui Grande, Sonora, Mexico.

W. A. DENNIS, Supt. of the Mountaineer mine, at Nevada City, Cal., has returned from a trip to New York.

W. H. DAILY, general manager The Copper King, Ltd., has returned from Los Angeles, Cal., to San Francisco.

G. A. WRIGHT is superintending some mine development work for the English syndicate near Mayer, Yavapai Co., Ariz.

S. C. BAGG, manager of the New Comstock M. Co., operating near Kingman, Ariz., was in Los Angeles, Cal., last week.

W. E. NEVILLS, former Supt. Alahama mine, Tuolumne Co., Cal., has returned from Nome, Alaska, and gone to Tonopah, Nevada.

C. W. TOZIER, of San Francisco, Cal., has returned from an examination of some mines in the vicinity of Jacksonville, Cal.

A. C. MORISON, superintendent, and C. A. O'Connell, millman at the Crystalline gold mines, at Rawhide, Cal., are in San Francisco.

JAMES HEALY, former foreman De Lamar and April Fool Companies, De Lamar, Nevada, is now with the Salt Lake & Tonopah M. Co.

W. H. AUBURY has sold his Los Angeles, Cal., assay office and assumed charge of the Cyclopic group of mines, White Hills, Arizona.

D. C. MONROE, manager of the White Horse and Copper Chief mines, near Jerome, Ariz., has returned from a mine inspection trip in Mexico.

O. P. LINDLEY, late foreman of the Tom Thumb Co., at Republic, Wash., has been appointed Supt. of the Princess Maud mine at the same place.

F. D. BROWN, C. E., of San Francisco, Cal., is at Guaymas, Sonora, Mexico, in charge of the railway surveys for the Mexican Anthracite Coal M. Co.

M. F. PERRY, general manager Minas Prietas Reduction Syndicate, has returned to Sonora, Mexico, from a business visit to Virginia City, Nev.

I. L. PARKER, formerly of Rossland, B. C., has been appointed manager of the North Star mine, in East Kootenay, B. C., succeeding F. Robbins, resigned.

W. S. WARD, of Denver, Colo., has been appointed by Chas. D. Walcott, Director of the U. S. Geological Survey at Washington, to collect the statistics of gold and silver production of Colorado.

THEO. F. VAN WAGENEN, general manager Nevada Copper Co., Lovelock, Nev., has resigned and accepted the managership of a British mining company at Buluwayo, Rhodesia, South Africa. He leaves on the 20th inst. for Capetown, S. A., via London.

JOS. MCGILLIVRAY, a pioneer California miner, who has been doing considerable in the Yukon Territory since '98, was recently the deserved recipient of a handsome testimonial, including a gold watch and chain, from his fellow passengers on the down trip of the steamer Whitehorse, from Dawson to San Francisco, on the occasion of his seventy-third birthday. Mr. McGillivray returns to the Klondike next week.

JESSE SCOBEY, of Denver, Colo., has resigned as general manager Colorado Zinc Co., to take a similar position with the Pride of the West Mining & Milling Co., at Washington Camp, Arizona, the appointment going into effect to-day. Mr. Scobey succeeds Mr. Emerson Gee in the latter position.

CHARLES JANIN, recently in the employ of the Chainman Mining & Electrical Co., at Ely, Nevada, terminated his engagement and has returned to San Francisco, because of an injury to his knee which happened while he was surveying underground. He has been obliged to use crutches and to keep his leg in a plaster cast for the past six weeks. His physician hopes for a total cure before the end of the present month.

Latest Market Reports.

SAN FRANCISCO, March 13, 1902.

SILVER.—Per oz., Troy: London, 25½d (standard ounce, 925 fine); New York, bar silver, 54½c (1000 fine); San Francisco, 54½c; Mexican dollars, 45½c San Francisco, 43½c New York.

COPPER.—New York: Lake, 1 to 3 casks, $12.25; carload lots, $12.50; Electrolytic, 1 to 3 casks, $12.12½; carload lots, $12.37½; Casting, 1 to 3 casks, $12.25; carload lots, $12.00. San Francisco: $15.15. Mill copper plates, $18.15; bars, 24@18c. London: £54 10s per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; plg, $4.75. London, £11 8s 9d per ton = 2.40 cents per lb.

SPELTER. — New York, $4.22; St. Louis, $3.95; London, £17 15s per ton; San Francisco, ton lots, 5½c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

IRON.—Pittsburg, Bessemer plg, $17.25; gray forge, $16.00; San Francisco, bar, 2.60c per lb., 2.65c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $30.00; open hearth billets, $31.75; San Francisco, bar, 7c to 12c per lb.

TIN. — New York, plg, $25.50; San Francisco, ton lots, 27c; 1000 lbs., 27½c; 500 lbs., 27½c; 200 lbs., 27½c; less, 28c; bar tin, ₱ lb, 30c.

PLATINUM.—San Francisco, orude, $17 ₱ oz.; New York, $18 per Troy oz.

QUICKSILVER. — New York, $51.00 large lots; London, £8 17s 6d; San Francisco, local, $47.50 ₱ flask of 76½ lbs.; Export, $45.00

MAGNESIUM.—New York, $2.90 ₱ lb.; San Francisco, $3.75.

BISMUTH.—New York, ₱ lb., Subnitrate, $1.50; San Francisco, $2.50 to $2.75 ₱ lots.

ZINC.—San Francisco, 5½c; slab, 5¾c; bar, 7c; zinc dust, N. Y., 6c.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 18c; San Francisco, Plumbers', 100-lb. lots, 15.30c.

NICKEL.—New York, 50@60c ₱ lb.

FERRO-MANGANESE. — Pittsburg, 80%, domestic, $53.50, large lots.

TUNGSTEN.—New York, ₱ lb., 95c; San Francisco, $1.15.

FERRO-TUNGSTEN. — New York, 37%, 32c; San Francisco, 65c (60%).

ASSAY LITHARGE.—San Francisco, 10c ₱ lb, small lots.

PHOSPHORUS. — F. o. b. New York 50@60c ₱ lb.

POWDER.—F. o. b. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12o. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ₱ set; 14 oz., 40s., 9c.

OILS.—Linseed, pure, boiled, bbl., 76c; cs., 81c; raw, bbl., 74c; cs., 79c. Deodorized Stove Gasoline, bulk, 15c; do., cs., 21½c; 86° Gasoline, bulk, 21c; do., cs., 26c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 19½c; Lard Oil, Extra Winter Strained, bbl., 90c; cs., 95c; No. 1 bbl., 65c; cs., 70c. Neatsfoot Oil, coopers' bbls., 70c; cs., 75c; No. 1 bbl., 50@52½c; cs., 55@57½c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, bd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $8.50; Colorado Anthracite, $14.00. Coke, $16 per ton in bulk; $18 in sacks.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 30@31c ₱ lb.; carloads, 28@29c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ₱ lb.; soda ash, $1.90 ₱ 100 lbs.; hyposulphite of soda, 2½@3c ₱ lb.; blue vitriol, 5½@6½c ₱ lb.; borax, concentrated, 7@8c ₱ lb.; chlorate of potash, 12@13c; roll sulphur, 6c; alum, $1.90@2.00; flour sulphur, French, 2½@2½c; California refined, 1½@2c; nitric acid, in carboys, 8c ₱ lb.; caustic soda, in drums, 3@4c ₱ lb.; Cal. s. soda, bbls., $1.25 @1.50 ₱ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins.

Catalogues Received.

The Keystone Driller Co. has issued Catalogue No. 2 on the Keystone Mineral Prospecting Machines. What is doing in perfecting methods and machines for prospecting for mines receives very full and complete illustration in this catalogue. To tangibly appreciate the rapid and considerable improvement made in this foundation branch of the art of mining this No. 2 Catalogue need only to be compared with the No. 1 Catalogue issued by the same company. Each is of its time up to the date of it. The No. 2 Catalogue is of the latest date and is commended as a text book on the subject of machine prospecting for mines. It will be mailed on application being made to the Keystone Driller Co., at Beaver Falls, Pa.

Recently Declared Mining Dividends.

	Payable.
Colorado City M. & Leasing Co., Colo., $2 50 per share, $65,000.	March 10
Daly-West M. Co., Utah, monthly 40 cents per share, $60,000.	March 15
Yankee Con. M. Co., Utah, No. 3, 5 cents per share, $25,000.	April 1
Elkton Con. G. M. Co., Colo., quarterly, 4 cents per share, $100,000.	March 15

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING MARCH 4, 1902.

694,516.—CAMERA—Akers & Richards, Ione, Or.
69 ,452.—WOOD PIPE MACHINE—A. Anderson, Burnett, Cal.
694,906.—IRONING MACHINE—C. W. Anderson, Los Angeles, Cal.
694,316.—COACH SUSPENDER—W. N. Burt, Los Angeles, Cal.
694,458.—CAPPING MACHINE—L. J. Borie, S. F.
694,318.—TREATING METALS—G. C. Carson, Redding, Cal.
694,528.—VOTING MACHINE—H. B. Cary, Los Angeles, Cal.
694,460.—STOVE DAMPER B. J. Casterline, Olalla, Or.
694,620.—STREET SWEEPER—W. C. Dingle, Los Angeles, Cal.
694,360.—IRONING TABLE—E. Fisk, No Yakima, Wash.
694,632.—SEWING MACHINE GAGE—G. Gorelson, Los Angeles, Cal
694,7.0.—TREE TRANSPLANTER—G. G. Guenther, Los Angeles, Cal
694,741.—RAILWAY SWITCH—G. G. Guenther, Los Angeles, Cal.
694,742.—RAILWAY SWITCH—G. G. Guenther, Los Angeles, Cal.
694,476.—TRACTION ENGINE—B. Holt, Stockton, Cal.
694,543.—CANE LOADER—A. Horner, Paauilo, Hawaii, H. T.
694,865.—TREE STAND—C. Kachold, Portland, Or.
694,554.—DOOR MAT—C. Kuhn, Fruitvale, Cal.
694,555.—SAW HANDLE—E. L. Laherty, Verdi, Nev.
694,662.—DARNING LAST—A. E. Macdonald, S. F
694,591.—KITCHEN IMPLEMENT—H. C. Needham, Los Angeles, Cal.
694,429.—ROTARY HARROW—M. Schichti, No Yakima, Wash.
694,804.—MICROMETER GAGE—J. Stromberg, Phœnix, Ariz.
694,807.—SAUCEPAN—R. B. Vanderberg, Los Angeles, Cal.
694,509.—GAME—G. W. Winckfield, Oakland, Cal.
694,514.—SCREW JOINT—F. Wulff, Colusa, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

DOOR MATS.—No 694,554. March 4, 1902 Charles Kuhn, Fruitvale, Cal. This door mat consists of a frame having a grill work of interlocking patterns the edges of the parts serving as scrapers to cleanse loose dirt from the feet, and in conjunction with this is a detachable device by which the edge of the frame may be clamped upon the fibrous or

flexible mat which is subsequently used to complete the cleaning of the shoes.

DARNING LAST.—No 694,562; March 4, 1902. A. E. Macdonald, San Francisco, Cal. This device consists of a spheroid having a handle projecting from one side, a groove or channel around its periphery and an elastic ring adapted to clamp the material so that it is smoothly stitched over the outer end of the spheroid. If desired the ends of the spheroid may be provided with shallow channels crossing each other to form guides for the needle so that the mended place will be symmetrical.

CANE LOADERS.—No. 694,548. March 4, 1902. A. Horner, Paauilo, Territory of Hawaii. This device is designed for loading cane upon wagons, railroad cars or other conveyers in the fields. It consists in combination of a derrick mounted on a wheeled platform, means by which the mast of the derrick may be mounted in an essentially vertical position irrespective of the nature of the ground, and an adjustable seat for the inner end of the boom whereby the boom with its load may be automatically moved to discharge at any desired point.

DETACHABLE HANDLE FOR SAWS.—No 694,555. March 4, 1902. E. L. Laherty, Verdi, Nev. Nine-twentieths assigned to J. F. Condon of same place. This invention relates to detachable handles especially designed for crosscut saws. It consists of a sleeve or socket piece fixed and projecting at right angles from the handle, having a plate at the outer end approximately parallel with the handle and grooved at its front edge to receive and hold the end of the saw blade. An oval hole is made through the sleeve and a split bolt passes through the hole having a pin projecting from one-half and a corresponding socket in the other. The rear end of the bolt is screw-threaded and provided with a thumb nut by which it may be drawn back and the edge of the saw locked in the grooved face. The oval shape of the bolt hole allows the elastic sides of the split bolt to separate when they lie in the direction of the longest diameter of the hole, the pin is then withdrawn from its socket and the saw can be introduced or removed. When the saw is in the proper relative position to the handle the pin is turned at right angles or so that the separated sides correspond with the shortest diameter of the oval opening, and this forces them together and engages the pin with the hole in the saw so that when the nut is turned the saw will be firmly locked in place.

SITUATIONS WANTED.

AN EXPERIENCED ASSAYER AND CHEMIST is open to an engagement. Excellent references given. Address A. W., care of this office.

MINING ENGINEER, with many years experience as manager and superintendent, is open for an engagement. Is at present engaged as superintendent of a large copper mine. Address Engineer, care Mining and Scientific Press.

AN ALL-ROUND PRACTICAL MINER, TIMBERMAN and Tool Sharpener wants position as Foreman; also good Surveyor. Twenty-two years' experience. Successful in handling men. Regular habits. Can earn my pay. Address L. A. P., this office.

MINING ENGINEER, practical miner and mill man, assayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best references. Now working in southern California. Address A. M. P., care of Mining and Scientific Press.

WANTED.—Position as superintendent of quartz mine. Worked as miner, engineer, mill man and superintendent. Superintendent at present. Would engage for foreign service. References given. Address Economy, this office.

WANTED.—POSITION AS MILL SUPERINtendent or Foreman. Understand concentration, amalgamation, cyanidiog and assaying. Seventeen years' experience. Address "Mill Foreman," care of Mining and Scientific Press.

WANTED.—POSITION AS ASSAYER, SURveyor, or Assistant Superintendent by technical graduate; three years' experience in mines of California and Colorado. Address I. E. D., care of Mining and Scientific Press office.

WANTED.—SITUATION AFTER MARCH 15, 1902, as Manager or Superintendent of mine. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work. Four years' experience as manager and superintendent. Treatment of low grade ores a specialty. Practical in every detail. State location of mine and salary. Best of references. Address X. Y. Z., this office.

OPEN FOR ENGAGEMENT, A MINING AND Metallurgical Engineer. Eleven years' experience as Consulting Engineer and Manager. Graduated from the best technical schools in Europe. Specialty: examination and management of gold and silver properties. Location must be in California, Arizona or Nevada. Salary $5000 per year. Address C. A., care Mining and Scientific Press.

WANTED.

CAPITAL WANTED.—I am in a position to secure a valuable quartz proposition (gold). Can get a good working bond on same. Will give best of reference as to character and ability. W. B. GRANT, Tuttletown, Tuolumne Co., Cal.

WANTED—A Second-Hand Concentrator in first-class order, delivered to railroad. Give description and cash price.

Address N. S. TROWBRIDGE, 2133 Parker St., Berkeley, Cal.

FOR SALE.

FOR SALE—80 Acres of Mining Land on Squaw Creek, in Backbone Mining District, Shasta Co. Cal. Quartz Claims on Land.

Address Room 28, No. 401 California Street, San Francisco, Cal.

FOR SALE.—A well-established assay office and laboratory doing an excellent business, located in an interior town and within a few hours of the Mother Lode mines. Must be sold by Mar. 1. Best of reasons for selling. Address Wiest-Stradley Process Co., No. 39 N. American St., Stockton, Cal.

FOR SALE.—Cyanide plant and lease on 30,000 tons tailings; 10,000 tons average $6.24, 70% of which is gold. Reason for selling: business of greater importance. Address Box 99, Steeple Rock, Grant Co., New Mexico.

QUARTZ AND PLACER PROPERTIES in Siskiyou Co., Cal., for Sale.

Collections attended to. B. K. COLLIER, Attorney-at-Law, Etna Mills, Cal.

FOR SALE.

A first-class 125 horse power Atlas-Corliss engine with a 10-ft. fly wheel, 10 in. face; 50 ft. 3½ in. shaft log with drums, belts, etc. Also a 44 3½ in. tube horizontal boiler with smoke stack and all attachments complete. All in good order and only in use for about a year. Inquire of

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SACRAMENTO, CAL.

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Our line of Pumps is the most varied and complete carried by any supply house in the West. These Pumps are all in good condition. Write us for quotations.

Send for Catalogue No. 37.

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QUICKSILVER MINE in California, near railroad; fully equipped; new furnace; plenty cheap fuel for years; now paying handsome profits; one of the best mines in the State. A snap if you get it soon. Call on or write

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47 Merchants' Exchange, San Francisco, Cal.

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A Fine Opportunity for a Mine to Secure Engine Cheap.

IMMEDIATE DELIVERY.
Torbert & Peckham,
MONADNOCK BLDG.....CHICAGO, ILL.

ASSESSMENT NOTICES.

ROSS VALLEY LAND COMPANY.—Location of principal place of business, San Francisco, Cal.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 13th day of February, 1902, an assessment of seven dollars and fifty cents ($7 50) per share was levied upon the capital stock of the corporation, payable immediately to Charles P. Eells, the secretary of said corporation, at room 211, in the Crocker building, at the corner of Post and Market streets, in the city and county of San Francisco, state of California.

Any stock upon which this assessment shall remain unpaid on the 20th day of March, 1902 will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on the 5th day of April 1902, to pay the delinquent assessment, together with costs of advertising and expenses of sale.

CHARLES P. EELLS,
Secretary Ross Valley Land Company.
Room 211, Crocker building, San Francisco, California.

GARIBALDI MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Mariposa County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 5th day of February, 1902, an assessment (No. 2) of one and one-half cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, Room 15 Nevada Block, 309 Montgomery street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 15th day of March, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 7th day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

WILLIAM McPHERSON, Secretary.

Office—Room 15 Nevada Block, 309 Montgomery street, San Francisco, California.

TANANA MINING COMPANY.—Location of principal place of business, San Francisco, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 4th day of March, 1902, an assessment (No. 5) of ten cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Room 405 Claus Spreckels Building, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 7th day of April, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on TUESDAY, the 29th day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

EDWARD H. STEARNS, Secretary.
Office—405 Claus Spreckels Building, San Francisco, California.

LITTLE STANDARD OIL COMPANY.—Location of principal place of business, San Francisco, California; location of works, McKittrick District, Kern County, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 4th day of March, 1902, an assessment (No. 3) of ten cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Room 40, Chronicle Building, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 12th day of April, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 12th day of May, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

R. L. CHENEY, Secretary.
Office—Room 40, Chronicle Building, San Francisco, California.

EUREKA CONSOLIDATED DRIFT MINING COMPANY.—Location of principal place of business, San Francisco. California; location of works, Placer County, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 25th day of February, 1902, an assessment (No. 34) of one-half (½) cent per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, Room 31, 214 Pine street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 31st day of March, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 21st day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

GEO. W. DIXON, Secretary.
Office—Room 31, 214 Pine street, San Francisco, California.

LARKIN MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, El Dorado County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 5th day of March, 1902, an assessment (No. 12) of two (2) cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, 112 Main street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 12th day of April, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 5th day of May, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

N. F. REMINGTON, Secretary.
Office—112 Main street, San Francisco, California.

YUBA CONSOLIDATED GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Nevada County, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 19th day of February, 1902, an assessment (No. 6) of three cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Rooms 58-59, 214 Pine street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 24th day of March, 1902, will be delinquent and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 14th day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

JAMES B. BROOKS, Secretary.
Office—Rooms 58-59, 214 Pine street, San Francisco, California.

DELINQUENT SALE NOTICE.

CONSOLIDATED ST. GOTHARD GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Nevada County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 20) levied on the 1st day of February, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
Block, Samuel	350	500	25 00
Bauer, Teresa	518	200	10 00
Koch, C. A.	116	100	5 00
Koch, C. A.	133	11	55
Koch, August	139	11	55
Koch, August	329	100	5 00
Raabe, Geo. A.	354	200	10 00

And in accordance with law, and an order of the Board of Directors, made on the 1st day of February, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, Rooms 113 and 114, Crocker Building, San Francisco, California, on MONDAY, the 24th day of March, 1902, at the hour of 2 o'clock P. M. of said day, to pay delinquent assessment thereon, together with cost of advertising and expense of sale.

B. N. SHOECRAFT, Secretary.
Office—Rooms 113 and 114, Crocker Building, San Francisco California.

DELINQUENT SALE NOTICE.

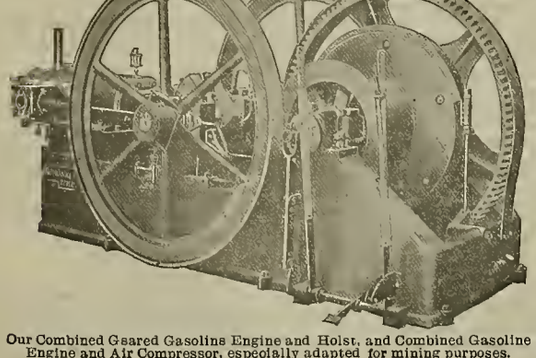
SILVER KING MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Pioneer Mining District, Pinal County, Arizona Territory.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 23) levied on the 31st day of January, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
F. Avery, Trustee	7393	1000	$250 00
F. Avery, Trustee	7415	400	100 00
F. Avery, Trustee	7416	300	75 00
Michael Levy	7253	100	25 00
Nat. Stein, Trustee	7243	50	12 50
Nat. Stein, Trustee	7247	50	12 50
John Turnbull, Trustee	6754	100	25 00
New York Issue.			
Wm. Hyndman	89	100	25 00
R. H. Merrick	188	100	25 00
Michael Levy	1015	100	25 00

And in accordance with law, and an order of the Board of Directors, made on the 31st day of January, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, No. 310 Pine street, Room 36, San Francisco, California, on TUESDAY, the 8th day of April, 1902, at the hour of 1 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of the sale.

J. W. PEW, Secretary.
Office—310 Pine street, Room 36, San Francisco, California.



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MINING AND SCIENTIFIC PRESS.

Whole No. 2174.—VOLUME LXXXIV. Number 12. SAN FRANCISCO, CAL., SATURDAY, MARCH 22, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Is Overproduction of Gold Possible?

Students of statistics, noting the rapid increase of annual gold production of the world during the last ten years, and noting also an ever-widening field for the mining of it, have been seriously debating among themselves the possibility of an overproduction. The practical miner, actively engaged in getting out all he can for himself now, is giving himself little concern about his successor's gold production and what he has to do with it when he gets too much. There is a novelty about the conception of the idea of an overproduction of gold that makes it a fascinating subject of discussion. No miner has ever been able to realize that his mine ever made an overproduction for him, and, it might be added, every miner wants for himself the mines that will make such an overproduction.

Seriously considered, the subject has little more than an academic interest at present, and, despite predictions of the professors, does not look possible of becoming of economic interest. It is true that gold is now mined from what was the wastes of mining twenty years ago. Refinements of practice are continually reducing even these small wastes made. The machine cheapening of work has made possible the extension of gold mining to enormous masses of rocks which can now be considered as being low-grade ores. New regions of the earth are being found gold-bearing and are being exploited with a tremendous application of energy. This is one view of the proposition.

The other view shows that gold mines do become worked out. The new sources of production in large part simply replace a source of production disappearing toward the vanishing point. The recovery of gold from the old wastes of gold mining makes more impression on the imagination, and less on the pocket, than the gold mining of the deposits from which the wastes were made. California in forty years up to 1890 yielded more than $1,000,000,000 of gold from her placers. Does anyone reasonably assume that from the wastes of those placers another $1,000,000,000 is coming in forty years, or even in several times forty years? The same reasoning applies to its quartz gold production. The wastes of the old workings will add to future production, but they cannot be expected to duplicate the quantity of the old or the concentration of its production in an equal time period.

The machine cheapening of mining work extending the field of gold mining to the low-grade ores again appeals more to the eye and imagination, and less to the pocket, than the past working in the high-grade ores. A flat dotted over with dredgers makes a great show, and is recovering gold that the old mining methods and machines could not touch, but the aggregate annual gold recovery of the flock of dredgers working in the low-grade gravel flats is less than that of one of the old time drift or hydraulic mines in a rich channel placer. The stamp mill of 100 heads working on mountain-like masses of low-grade ore is impressive, but it does not necessarily mean more gold than one of the old time 10-stamp mills working in bonanza ore.

It is beyond question that we can see more gold in place available for ultimate recovery than at any previous period of the world's history. The seeing of it now, however, is only one element in the problem of future gold production. Another element is time. Taking account of the time that it will require to get this gold out of the rocks, and its rate of production and the total mass of gold we estimate, is rather an abstraction than an economic factor.

Another factor in the equation is the fact that just as the quantity of gold coming out of the earth increases, so does the stream returning it to the earth again increase. With the increase of population of the world, and of the extension of its arts, more and more gold is consumed as a use instead of accumulating as a measure. As a use it is being buried again almost as fast as it is being dug up. As a use, too, it is quite within reason to assume that what might be an overproduction of a measure merely will be absorbed by a geometrically expanding consumption.

Even as a measure, the common interchangeable thing for all man's desires, the service required of gold would appear to be a quantity increasing in geometrical ratio. The aggregate of wealth, with all the devices invented for simplifying and quickening exchanges, is becoming so vast that enormous increases in gold production are absorbable as money without increasing values suddenly, which is the only way by which an overproduction of gold would become appreciatable. The overproduction of gold is, anyway, not a question for miners. It would seem rather one for the consideration of astronomers.

Ward & Hall Placer Claim, Spruce Creek, Atlin, B. C.

Muirhead Bro.'s Placer Claim, Spruce Creek, Atlin, B. C.

Atlin, B. C., Placer Mining.

The illustrations on this page are typical placer mining scenes in Atlin, B. C., mining district. So far as there is anything distinctive or specially characteristic of a locality about them, they could be referred to as illustrating typical placer mining scenes in California or Oregon. The appliances and methods shown are exactly alike. The sluice boxes, derrick, water wheels, bedrock cuts, miners' cabins and tents and the background of rounded tree-clad hills illustrate a similarity of conditions that is suggestive of the common likeness of placer mines everywhere.

Atlin placer mining has had some setbacks from causes now removed. The deposits, while extensive, do not average as rich as those in the Klondike. The climatic conditions are, however, more favorable to mining operations and to the use of cheap hydraulic methods. The last two years have witnessed consolidations of many of the small individual location claims, that would be worked in the manner illustrated, into large groups, for which extensive ditch and hydraulic constructions and installations have been made. Some of these have been far enough along to test for commercial results which have been highly satisfactory. A number of others are still in construction and installation stages. The district as a whole has at this time by far the larger amount of hydraulic mining installations made in the far North, and it is believed the results of working will show lower costs than can be obtained in other northern districts.

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By CHARLES V. JENKINS.

CAPITAL.—Capital expenditure accounts are debited with all disbursements which result in the acquirement of something of permanent value.

Such entries require very careful inspection, not merely to prove clerical accuracy in recording the transactions, and the vouchers and receipts covering them, but also the legitimacy of their classification as capital expenditures. A systematic investigation of the amounts carried to capital, and of all entries of amounts expended and covered into the accounts of buildings, plants, machinery, equipment, air-pipe lines, water mains, etc., etc., should afford an approximate verification of the correctness of these property accounts, and put to proof the fairness of the valuation of the several plants carried as assets.

These accounts should be also scrutinized, to see that they are duly credited with amounts written off, from time to time, for depreciation. Such amounts, taken out of income for the deterioration of plant, are usually debited to profit-and-loss direct, but are sometimes carried by a charge to a depreciation account.

A close discrimination between expenses properly chargeable to capital and to revenue, respectively, is of vital importance; for it is apparent that if too great a portion of the expense of any year be charged against capital, then the current expenses will appear smaller and the profit correspondingly greater. On the other hand, if the entire cost of plant and equipment, or of improvements, which, for all practical purposes, may be considered of permanent value, is charged against the operating expense or cost of mining of any year, a true profit with respect to the ordinary working expenses and receipts may be made to appear as a loss. If the whole, or any portion, of the development work of a mine for any year be charged to capital and the current operating expense be relieved of this cost, the apparent profit will he unduly increased.

In the business of mining, custom has not yet established a uniform method of treating expenditures for renewals and repairs of machinery, plant and equipment. In fact, the question of distinguishing between capital and revenue for sums expended in the original purchase, enlargements and improvements of plants is a matter of individual concern and choice. Some companies treat every expenditure for machinery and equipment as fairly chargeable to the cost of mining for the year during which the purchase was made. Practically, this method may he said to he correct; since the sums so expended are part of the expense of mining, and must eventually he repaid hy the revenue derived from the sale of the mine's product. Other companies are too prone to treat as capital not only the original purchase price, hut all sums expended for improvements, and for renewals and repairs as well. And some companies do, while others do not, make provision for depreciation. In any event, an examination of the accounts should prove that the aggregate amount appearing in capital accounts as expended for machinery, equipment, etc., is represented hy plant of that value, maintained in efficient repair.

As stated, an approximate verification of these amounts can be arrived at by tracing from their source all entries for items so charged. For example, in case a mining plant is purchased and erected under contract, it is easy to determine its original value hy reference to the contract. The erection of plants, the installing of machinery, etc., when done by a company by day's labor, involve a careful consideration of the cost of labor, as well as of material and supplies.

It must he confessed that the wages account is the most difficult of all to check effectually, especially in trying to distinguish between capital and revenue expenditures, when mining operations and construction are carried on simultaneously, and more especially when a company has no system of keeping and correctly recording amounts expended for wages. Where such a system exists, and where the records of one department are examined and checked by another and independent department, it will not he so troublesome to arrive at a comparatively accurate proving of the correctness of all wages charged to capital.

REVENUE.—In a mining enterprise of any magnitude the debit side of this account represents the expenditure of considerable money. An audit to determine the actual amount, and the correctness of the entries of expenditure of revenue must be very comprehensive.

The vouchers and receipts, in addition to the checking on the cash hook, must he critically inspected, and the classification and distribution of the expense represented by each voucher must be verified.

Mining supplies purchased are charged to revenue when used, not necessarily when paid for. This requires an exhaustive investigation into the nature and conduct of the stores accounts, and a complete checking of these accounts, to make sure that all supplies taken from stores are properly charged, when credited to the stores account. The entries covering these transactions should be gone into pretty thoroughly. The prices charged for supplies consumed should be compared with the purchase price and the cost as stated in inventory. An inventory ought to be taken of all material and supplies on hand, the values being compared with the purchase prices, and the total with the aggregate of the various stores accounts on the books.

Wages, salaries, and all fixed and general expenses, such as taxes, insurance, etc., are direct cash disbursements. All these items, with the possible exception of wages, can he effectually tested by comparing with the vouchers, and hy reference, when necessary, to the authority for the payment. As, for instance, the correctness of salaries paid could he ascertained from the directors who had the fixing of salaries; taxes, hy comparing the payments with the demands of the Government, etc.

In the matter of wages it is impracticable to verify all the items on the payrolls which go to make up the aggregate expenditure for labor. The distribution and legitimate "expensing" of the cost of labor can be fairly tested as explained; but an auditor may be obliged to rely to a considerable extent upon the system of inter-staff corroboration referred to above, and upon the certificate of an official in authority, as to the veracity of the various payrolls.

If all accounts representing the operating, fixed and general expenses of the business are carried into one account, "Costs of Mining," at regular intervals, a comparison of the entries in this account with the mining costs book will facilitate a verification of the aggregate expenditure chargeable to revenue.

PERSONAL ACCOUNTS.—Personal accounts, accounts and bills receivable, and accounts and bills payable, should be examined carefully. In the business of mining, accounts of this nature are not frequent, and liability of loss from bad debts or doubtful accounts is limited. Such accounts and the contingency of such loss, however, should be considered. The amount of accounts due and bills payable, as shown on the books, should be verified and taken into calculation in determining the gains or losses for the period under audit.

FINANCIAL STATEMENT.—The task of checking and verifying all book transactions being completed, the footings of all accounts in the ledger, whether closed or still operative, should be tested, balances verified, and a trial balance taken. The trial balance proving the correctness of the ledger, it is now in order to prepare a statement of assets and liabilities, and a statement of profit and loss.

The financial condition of the company should be very clearly set forth in this financial statement, the balance sheet exhibiting:

PROPERTY AND ASSETS.	CAPITAL AND LIABILITIES.
1—PROPERTY, showing mines and mineral claims, and other real property.	1—CAPITAL STOCK, showing in detail the number of shares; amount paid up; amount, if any, remaining unpaid; amount and nature of arrear of calls, particulars of forfeited shares, etc.
2—IMPROVEMENTS, showing buildings, machinery, plants, equipment, etc.; also stores and supplies on hand.	2—DEBTS AND LIABILITIES of the company, showing the amount of debts owed by the company, enumerating the same, and distinguishing actual from contingent liabilities, etc. These contingent liabilities, such as claims against the company not acknowledged as debts, or moneys for which the company is contingently liable, should be stated; but only the amount of acknowledged debt is carried out as a liability.
3—CASH AND INVESTMENTS, showing amount of cash on hand and in bank, the nature of investments, rates of interest, etc.	3—RESERVE FUND, showing the amount set aside from profits to meet contingencies.
4—DEBTS OWING TO THE COMPANY, showing all debts, accounts and bills receivable.	4—PROFIT AND LOSS, showing the disposable balance for payment of dividends, etc.

The statement of profit and loss should state specifically upon what accounts losses have been sustained, and detail the accounts through which profits have been realized. In calculating the gains and losses, it must be borne in mind that the loss or gain of a mining venture for any given period is not merely the difference between the receipts for ores sold and the cost of mining. Depreciation must always be taken into consideration.

REDEMPTION OF CAPITAL.—In connection with an audit it is essential that the questions of depreciation, dividends, surplus and redemption of capital be taken into account. Most industrial enterprises involve the same elementary principles. But there are considerations in mining which do not affect other kinds of business.

A mine cannot be said to be a permanent source of wealth. Every ton of ore mined and marketed involves a depreciation in the value of the property which cannot be repaired. Hence, during the life of a mine, not only must interest be realized upon the capital invested, but the capital itself must he recovered, if the venture is to prove successful. In this respect, depreciation and dividends may be considered as different causes operating to the same end, namely, the diminution of the value of the property.

DEPRECIATION.—Generally speaking, the loss upon assets which are diminishing in value is called depreciation. As applied to plants, equipment, mining machinery, etc. (provided the original cost of these items is not treated as a portion of the current operating expense, and so charged at time of purchase), a certain sum, estimated upon the life of the plant, should be charged against the gross revenue of each year, to replace the capital destroyed or reduced by wear and tear. The method of treating sums expended for plant as current expense is manifestly fair, both to the management desirous of making a record in the matter of mine costs and to the present stockholders; for, in the early stages of a mine, when most of the equipment is purchased, costs will be exaggerated, and dividends which might otherwise be paid may be deferred, by reason of this abnormal increase in the current expense account. But, since the life of mining machinery is comparatively short, and there is practically no residual value, in case the mine is abandoned as worked out, or the machinery has to be replaced by a plant of greater capacity, it is not only prudent hut absolutely necessary that some provision be made to redeem its cost.

Depreciation, as applied to the redemption of the capital invested in a mine, provides for the writing off of a certain sum each year, estimated upon the life of a mine, to accumulate a sinking fund for this purpose.

In the business of mining, however much may he said in favor of some method of accumulating a sinking fund, such a fund is seldom, if ever, provided for. The individual stockholder usually thinks that he would prefer to have his capital returned to him as fast as it may be taken from the mine, rather than await the accumulation of a fund sufficient to redeem the whole capital. To this end the custom prevails, and will probably be considered the better method, so far as mining is concerned, of repaying capital hy dividends. By means of dividends, or, as they might properly be called, enlarged dividends, the stockholder, after calculating a fair interest on his investment, can consider the sums received over and above this interest as repayments of the principal of his investment.

This method may be subject to some question, since there are few (except those who have given special thought to the matter) who properly appreciate the difference between a dividend which is purely a distribution of profits and a dividend which is intended to repay capital. Then there is this contingency to face: in the case of a successful mining enterprise it may transpire that the full amount of the company's capital is carried as a liability, when, in fact, it has all been repaid in the shape of dividends; while, on the other side of the balance sheet, the mine, valued at its original cost and worth, is still shown.

The amount paid in dividends in this way each year may be estimated, or rather will depend, upon the amount of output and the profit realized upon the sale of product.

DIVIDENDS.—The term dividend, as generally accepted, means a sum which a corporation sets aside from its profits to be divided among its members. It is a fundamental rule that dividends shall not be declared or paid when a company is insolvent, or the payment of which renders a company insolvent. A dividend must be declared from realized, and not from estimated, profits. The violation of this rule is not common. But it too frequently happens that when profit does not follow on the heels of promise the directors of a company, anxious to appease the importunity of stockholders, are led to ignore one of the most important precepts of financial prudence. Under this constraint they declare and pay dividends without first having provided a surplus or reserve fund; that is, a special fund of profits set aside for the purpose of meeting contingencies, or of equalizing dividends.

RESERVE FUND.—If such a fund, set apart from current income, or created hy withholding a small percentage of the annual net earnings, is shown upon the books, this account should be examined by the auditor, and its accuracy should be tested. The amount should be held, either in actual cash on hand, or on special deposit in bank, or invested in safe and readily convertible securities. A reserve fund once established should be drawn upon only in case of urgent necessity, or to meet exceptional and temporary reverses in profits.

The history of the mining industry is replete with records of companies wrecked hy adverse circumstances, hy reason of the lack of means with which

*Trans. American Institute of Mining Engineers, New York meeting, February, 1902.

to carry exploration to a probable successful issue—means which might have been provided at a time when the mine was earning regular profits. But with working capital exhausted; stockholders reluctant to pay assessments or to render themselves personally liable for borrowed capital; the ore reserves of the mine worked up to their limit, and no reserve fund to meet the exigency, the mine is abandoned. And thus is recorded another mining failure which a little forethought and business prudence might have averted.

Again, it may occur that a mine in the full flush of prosperity is compelled to discontinue dividends for a period. There would be fewer disappointed stockholders, in this respect, if the policy of providing a surplus were rigidly insisted upon. Regular dividends could be continued, and a most distressing period in the affairs of a mining company could be safely tided over if, during its most profitable period, provision had been made for such a crisis.

GENERAL REMARKS.—As has been observed, and will no doubt be confirmed by the experience of most mining engineers, there is a noticeable lack of uniformity in the systems of keeping mine accounts. Such irregularity in the matter of registering and recording the routine of business details at the mine may be attributed to arbitrary local conditions. But the absence of uniform system in the more important departments of accounting, especially in the treatment of expenditures and in respect to mine costs, must be ascribed, in part at least, to the scarcity of practical literature on the subject, and to lack of active discussion of the questions involved by those most vitally interested. In all other important productive industries, a considerable degree of conformity, not only in general system, but in details of shop organization, cost keeping, etc., has been established. This uniformity obtains, to a greater or less extent, even in manufacturing and mercantile pursuits, where processes and mechanical methods, locality, competition, and other conflicting influences, affect trade conditions.

It is not intended to insist pedantically upon similarity of forms, methods, and like details, nor is it deemed necessary, on the other hand, to formulate the reasons for a generally uniform practice with respect to mine accounts; but it may not be amiss to offer the opinion that in no other way can uniformity be secured except by concerted effort on the part of those who are actively interested in all that pertains to the economy of modern mining.

If, in connection with the many discussions relevant to the science and practice of mining, the business side of the question could receive the attention it deserves; if the interchange of ideas and opinions by those whose authority and interest are unquestioned were more frequent and general, reforms in this direction could be induced. By urging the adoption of a few conservative rules and principles of business which would tend to safeguard the commercial interests of mining, and by pressing the importance of a practicable uniformity in system and method, the engineering profession could increase the credit which it has already earned by what it has done to advance the business of mining from the plane of mere speculative gambling to its present high rank among the prosperous productive industries.

THE American Iron & Steel Association, on complete statistics received from the manufacturers, states that the total production of Bessemer steel ingots in 1901 was 8,713,302 gross tons. This production was by far the largest in the history of the country. Of the production last year 6764 tons were steel castings. The production of all kinds of Bessemer steel rails by the producers of Bessemer steel ingots in 1901 was 2,836,273 gross tons.

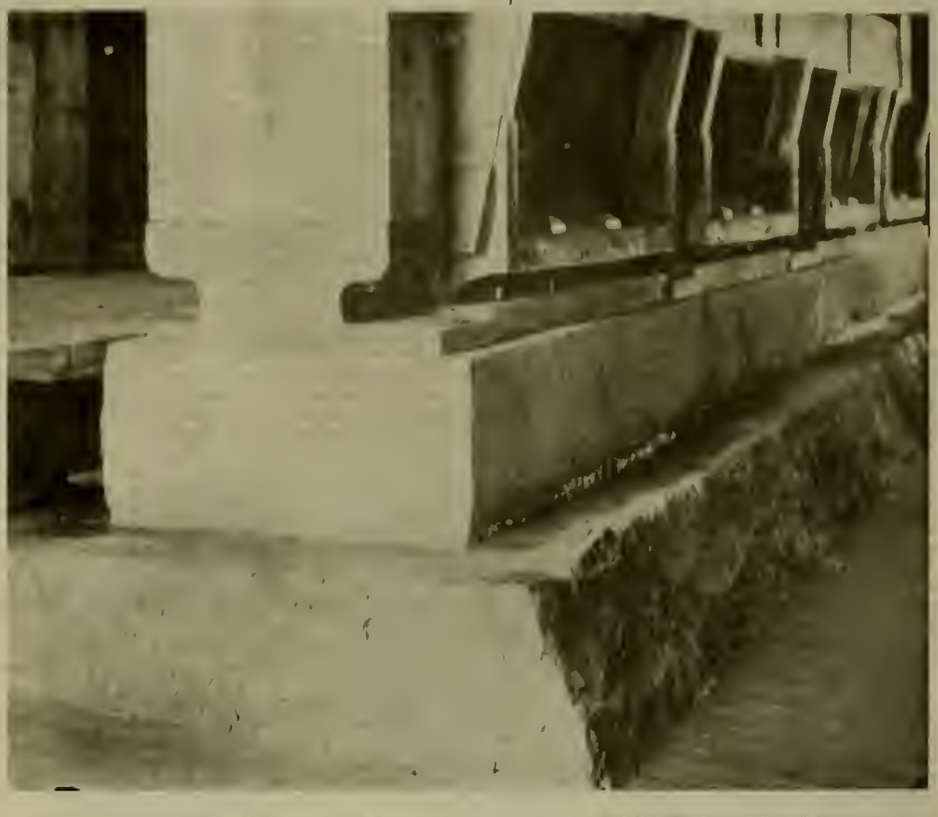
Foundations for Stamp Mill Mortars.

Written for the MINING AND SCIENTIFIC PRESS.

It seems to have been an almost universal practice to put a cushion of some kind under stamp mill mortars, and also to use wood blocks under this cushion, until the belief has become more or less firmly established, whereas correct theory would maintain that the mortars should be absolutely solid. No one thinks of putting a rubber or blanket cushion under an anvil. In a number of instances concrete foundations have been used with, in some cases, unfortunate results. In the Alaska-Treadwell mill cast iron blocks some 14 inches thick were used successfully, but these were expensive.

The 40-stamp mill which was erected at the Banner mine, near Oroville, Cal., some years ago, was provided with concrete bases for the stamp batteries. Two of the illustrations herewith are of this work during construction. The concrete mass was built in pyramidal form, 8 feet wide at the base. The bottom portion to a height of 3 feet was composed of one part of Portland cement, two parts of sharp quartz sand and five parts of broken rock. The cap portion, a foot deep, was made with a steadily diminishing proportion of the broken rock, and in the top 3 or 4 inches contains none at all. The foundation bolts for the mortars were set 33 inches deep in the concrete and extended 6 inches above the surface. The entire mass of the foundation was set on solid bedrock.

At the North Star mines, Grass Valley, Cal., some two years since, the old wood blocks with blanket cushions had become decayed and were taken out and a foundation built up of rough cement masonry, using rock from the dump. On top of this masonry were placed granite blocks about 16 inches thick, and on this granite the mortars, the anchor bolts extending down through the granite blocks to the anchor plates well down in the masonry. Castings were made to hold the battery posts, which were anchored to the masonry in the same way. The accompanying engraving will make the arrangement plainer than the description.



Concrete Base and Granite Foundations for Stamp Batteries, North Star Mill, Grass Valley, Cal.

Concrete Foundations for Stamp Batteries at Banner Mine, Oroville, Cal.

The mortars have now had over two years of service and are absolutely solid. The stamp stems do not break any more, if as much, as formerly, while the mill crushes more ore.

It may be worth mentioning, as a bit of experience gained, that when these mortars were first put up sheet lead $\frac{1}{32}$ of an inch thick was placed between the mortar and the granite, with the idea of its filling the interstices of the stone. It proved a mistake, however, and worked out, leaving the mortars loose. It was also found that years of pounding of the old mortars on a soft foundation had "dished" them

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3—CASH AND INVESTMENTS, showing amount of cash on hand and in bank, the nature of investments, rates of interest, etc.	3—RESERVE FUND, showing the amount set aside from profits to meet contingencies.
4—DEBTS OWING TO THE COMPANY, showing all debts, accounts and bills receivable.	4—PROFIT AND LOSS, showing the disposable balance for payment of dividends, etc.

The statement of profit and loss should state specifically upon what accounts losses have heen sustained, and detail the accounts through which profits have been realized. In calculating the gains and losses, it must be horne in mind that the loss or gain of a mining venture for any given period is not merely the difference hetween the receipts for ores sold and the cost of mining. Depreciation must always he taken into consideration.

REDEMPTION OF CAPITAL.—In connection with an audit it is essential that the questions of depreciation, dividends, surplus and redemption of capital he taken into account. Most industrial enterprises involve the same elementary principles. But there are considerations in mining which do not affect other kinds of business.

A mine cannot be said to be a permanent source of wealth. Every ton of ore mined and marketed involves a depreciation in the value of the property which cannot he repaired. Hence, during the life of a mine, not only must interest be realized upon the capital invested, hut the capital itself must he recovered, if the venture is to prove successful. In this respect, depreciation and dividends may he considered as different causes operating to the same end, namely, the diminution of the value of the property.

DEPRECIATION.—Generally speaking, the loss upon assets which are diminishing in value is called depreciation. As applied to plants, equipment, mining machinery, etc. (provided the original cost of these items is not treated as a portion of the current operating expense, and so charged at time of purchase), a certain sum, estimated upon the life of the plant, should be charged against the gross revenue of each year, to replace the capital destroyed or reduced by wear and tear. The method of treating sums expended for plant as current expense is manifestly fair, both to the management desirous of making a record in the matter of mine costs and to the present stockholders; for, in the early stages of a mine, when most of the equipment is purchased, costs will he exaggerated, and dividends which might otherwise he paid may he deferred, hy reason of this abnormal increase in the current expense account. But, since the life of mining machinery is comparatively short, and there is practically no residual value, in case the mine is abandoned as worked out, or the machinery has to he replaced hy a plant of greater capacity, it is not only prudent hut absolutely necessary that some provision he made to redeem its cost.

Depreciation, as applied to the redemption of the capital invested in a mine, provides for the writing off of a certain sum each year, estimated upon the life of a mine, to accumulate a sinking fund for this purpose.

In the business of mining, however much may be said in favor of some method of accumulating a sinking fund, such a fund is seldom, if ever, provided for. The individual stockholder usually thinks that he would prefer to have his capital returned to him as fast as it may he taken from the mine, rather than await the accumulation of a fund sufficient to redeem the whole capital. To this end the custom prevails, and will probably be considered the hetter method, so far as mining is concerned, of repaying capital hy dividends. By means of dividends, or, as they might properly he called, enlarged dividends, the stockholder, after calculating a fair interest on his investment, can consider the sums received over and ahove this interest as repayments of the principal of his investment.

This method may he suhject to some question, since there are few (except those who have given special thought to the matter) who properly appreciate the difference between a dividend which is purely a distribution of profits and a dividend which is intended to repay capital. Then there is this contingency to face: in the case of a successful mining enterprise it may transpire that the full amount of the company's capital is carried as a liahility, when, in fact, it has all heen repaid in the shape of dividends; while, on the other side of the halance sheet, the mine, valued at its original cost and worth, is still shown.

The amount paid in dividends in this way each year may he estimated, or rather will depend, upon the amount of output and the profit realized upon the sale of product.

DIVIDENDS.—The term dividend, as generally accepted, means a sum which a corporation sets aside from its profits to he divided among its members. It is a fundamental rule that dividends shall not he declared or paid when a company is insolvent, or the payment of which renders a company insolvent. A dividend must be declared from realized, and not from estimated, profits. The violation of this rule is not common. But it too frequently happens that when profit does not follow on the heels of promise the directors of a company, anxious to appease the importunity of stockholders, are led to ignore one of the most important precepts of financial prudence. Under this constraint they declare and pay dividends without first having provided a surplus or reserve fund; that is, a special fund of profits set aside for the purpose of meeting contingencies, or of equalizing dividends.

RESERVE FUND.—If such a fund, set apart from current income, or created hy withholding a small percentage of the annual net earnings, is shown upon the hooks, this account should be examined hy the auditor, and its accuracy should he tested. The amount should he held, either in actual cash on hand, or on special deposit in hank, or invested in safe and readily convertible securities. A reserve fund once established should he drawn upon only in case of urgent necessity, or to meet exceptional and temporary reverses in profits.

The history of the mining industry is replete with records of companies wrecked by adverse circumstances, by reason of the lack of means with which

*Trans. American Institute of Mining Engineers, New York meeting, February, 1902.

to carry exploration to a probable successful issue—means which might have been provided at a time when the mine was earning regular profits. But with working capital exhausted; stockholders reluctant to pay assessments or to render themselves personally liable for borrowed capital; the ore reserves of the mine worked up to their limit, and no reserve fund to meet the exigency, the mine is abandoned. And thus is recorded another mining failure which a little forethought and business prudence might have averted.

Again, it may occur that a mine in the full flush of prosperity is compelled to discontinue dividends for a period. There would be fewer disappointed stockholders, in this respect, if the policy of providing a surplus were rigidly insisted upon. Regular dividends could be continued, and a most distressing period in the affairs of a mining company could be safely tided over if, during its most profitable period, provision had been made for such a crisis.

GENERAL REMARKS.—As has been observed, and will no doubt be confirmed by the experience of most mining engineers, there is a noticeable lack of uniformity in the systems of keeping mine accounts. Such irregularity in the matter of registering and recording the routine of business details at the mine may be attributed to arbitrary local conditions. But the absence of uniform system in the more important departments of accounting, especially in the treatment of expenditures and in respect to mine costs, must be ascribed, in part at least, to the scarcity of practical literature on the subject, and to lack of active discussion of the questions involved by those most vitally interested. In all other important productive industries, a considerable degree of conformity, not only in general system, but in details of shop organization, cost keeping, etc., has been established. This uniformity obtains, to a greater or less extent, even in manufacturing and mercantile pursuits, where processes and mechanical methods, locality, competition, and other conflicting influences, affect trade conditions.

It is not intended to insist pedantically upon similarity of forms, methods, and like details, nor is it deemed necessary, on the other hand, to formulate the reasons for a generally uniform practice with respect to mine accounts; but it may not be amiss to offer the opinion that in no other way can uniformity be secured except by concerted effort on the part of those who are actively interested in all that pertains to the economy of modern mining.

If, in connection with the many discussions relevant to the science and practice of mining, the business side of the question could receive the attention it deserves; if the interchange of ideas and opinions by those whose authority and interest are unquestioned were more frequent and general, reforms in this direction could be induced. By urging the adoption of a few conservative rules and principles of business which would tend to safeguard the commercial interests of mining, and by pressing the importance of a practicable uniformity in system and method, the engineering profession could increase the credit which it has already earned by what it has done to advance the business of mining from the plane of mere speculative gambling to its present high rank among the prosperous productive industries.

THE American Iron & Steel Association, on complete statistics received from the manufacturers, states that the total production of Bessemer steel ingots in 1901 was 8,713,302 gross tons. This production was by far the largest in the history of the country. Of the production last year 6764 tons were steel castings. The production of all kinds of Bessemer steel rails by the producers of Bessemer steel ingots in 1901 was 2,836,273 gross tons.

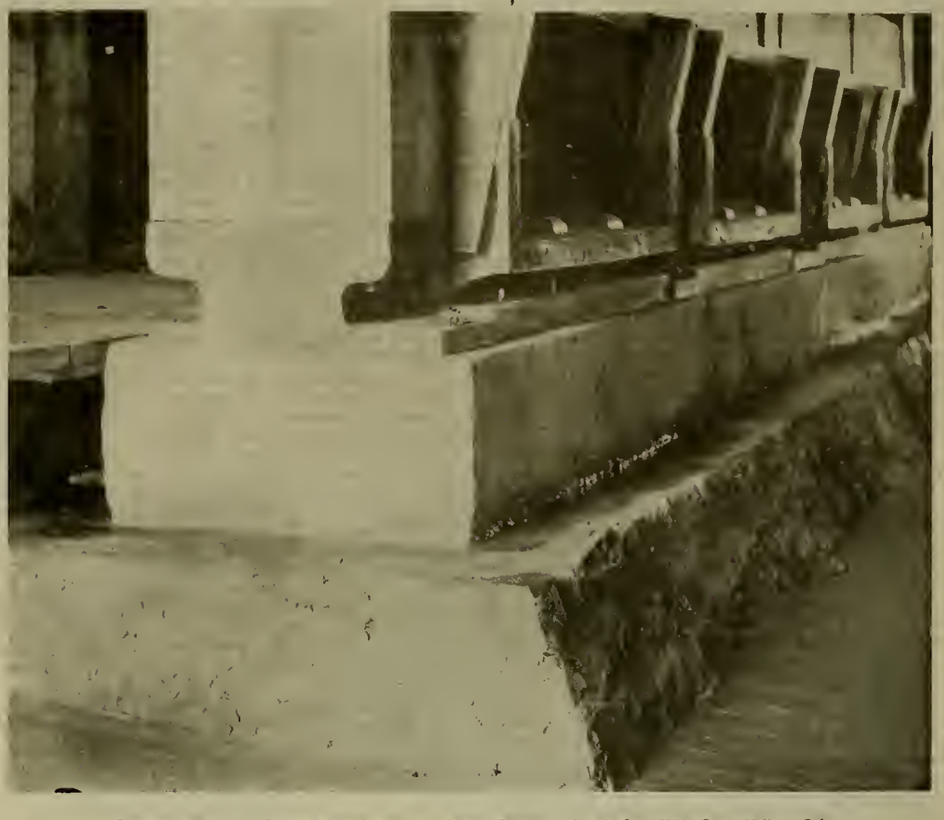
Foundations for Stamp Mill Mortars.

Written for the MINING AND SCIENTIFIC PRESS.

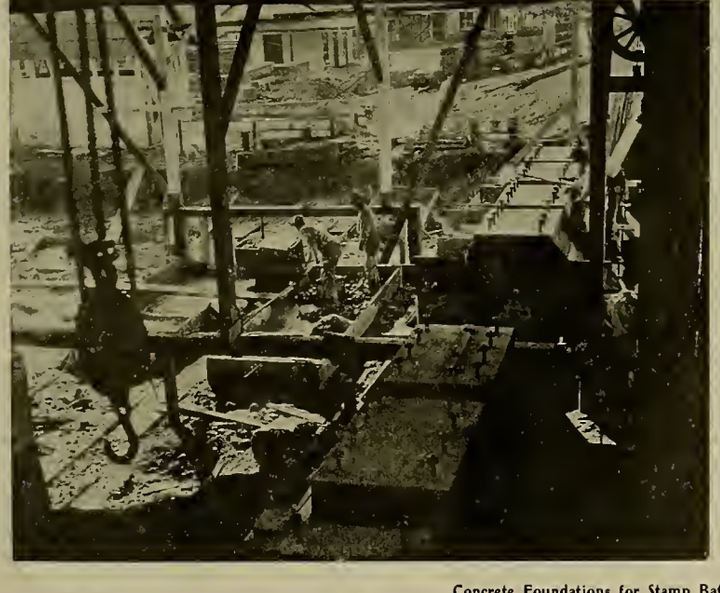
It seems to have been an almost universal practice to put a cushion of some kind under stamp mill mortars, and also to use wood blocks under this cushion, until the relief has become more or less firmly established, whereas correct theory would maintain that the mortars should be absolutely solid. No one thinks of putting a rubber or blanket cushion under an anvil. In a number of instances concrete foundations have been used with, in some cases, unfortunate results. In the Alaska-Treadwell mill cast iron blocks some 14 inches thick were used successfully, but these were expensive.

The 40-stamp mill which was erected at the Banner mine, near Oroville, Cal., some years ago, was provided with concrete bases for the stamp batteries. Two of the illustrations herewith are of this work during construction. The concrete mass was built in pyramidal form, 8 feet wide at the base. The bottom portion to a height of 3 feet was composed of one part of Portland cement, two parts of sharp quartz sand and five parts of broken rock. The cap portion, a foot deep, was made with a steadily diminishing proportion of the broken rock, and in the top 3 or 4 inches contains none at all. The foundation bolts for the mortars were set 33 inches deep in the concrete and extended 6 inches above the surface. The entire mass of the foundation was set on solid bedrock.

At the North Star mines, Grass Valley, Cal., some two years since, the old wood blocks with blanket cushions had become decayed and were taken out and a foundation built up of rough cement masonry, using rock from the dump. On top of this masonry were placed granite blocks about 16 inches thick, and on this granite the mortars, the anchor bolts extending down through the granite blocks to the anchor plates well down in the masonry. Castings were made to hold the battery posts, which were anchored to the masonry in the same way. The accompanying engraving will make the arrangement plainer than the description.



Concrete Base and Granite Foundations for Stamp Batteries, North Star Mill, Grass Valley, Cal.



Concrete Foundations for Stamp Batteries at Banner Mine, Oroville, Cal.

The mortars have now had over two years of service and are absolutely solid. The stamp stems do not break any more, if as much, as formerly, while the mill crushes more ore.

It may be worth mentioning, as a bit of experience gained, that when these mortars were first put up sheet lead $\frac{1}{32}$ of an inch thick was placed between the mortar and the granite, with the idea of its filling the interstices of the stone. It proved a mistake, however, and worked out, leaving the mortars loose. It was also found that years of pounding of the old mortars on a soft foundation had "dished" them

somewhat, though they had heen planed when made. It was, therefore, necessary to remove the mortars and cut the granite surface slightly concave, after which there was no more trouhle.

Three Prospectors' Yarns.

Written for the MINING AND SCIENTIFIC PRESS.

We have come together once more, and each is seated in his favorite chair before the open fire of the cahin. There is strength in union, and, let me confess, each thought the other had made a strike during his three months of prospecting, and with a glad heart he returned to the Pizen Dog claim of the Salmon mountains to share and enjoy it. "Hope springs eternal in the miner's hosom," and the reader who remembers our efforts to cyanide ore in place [published in the MINING AND SCIENTIFIC PRESS, Feh. 2, 1901] will recognize our party. Old Joe, the sometime Heidelherg student of metallurgy; Manuel, the Portuguese cook and man of all work, with an unsatisfied thirst, and the other fellow.

We spent the evening describing our prospects and traces. The next day was devoted to getting Joe's muffle furnace into shape for assaying, bucking samples and cleaning up the cahin, preparatory to "holing up" for the long winter.

"By the way, Manuel, where did you leave Quo Vadis?"

"Oh, that a mule? Mebbe he come hye an' hye."

We hoth looked at our cook, and he, evidently having expected the question, deliberately seated himself upon a powder box and settled himself for the inquest. In his unwritahle English he hegan:

"I left that mule helly deep in the river. He was ahout half way over, and I packed the duffle to the shore. Yes, I had to swim some, and everything was wet. It was then I decided to return to camp; but I left the mule in the river. Mayhe he is there yet; I don't know. He was there when I came away."

"What? Drowned?"

"Oh, no; that mule he just stand there like a rock; hut it wasn't the mule that stood there—what you call halk—but a worse one than the mule. Mayhe I had hetter tell you all ahout it. You know that mule I ride very well sometimes. Every morning when I start he hucks me off; hut I lick him pretty hard, and he is a good mule to ride then; but never could I put a pack on him. He hucked everything off, and then kicked the packsaddle to pieces. This made me very sad, for I liked that mule. One day I rode down a trail and came to a camp. The man came from Callahan. You know the kind of native. He knew everything in the world, for he once saw the cars go hy at Gazelle. He told me all he knew in ahout an hour; but he told it over several times that night, till I went to sleep. In the morning he said: 'That mule of yours is not much good, is he? So how will you swap him for my fine horse? My fine Callahan horse is too good to pack, hut I will trade him even for your poor old mule.' I said: 'I will trade; hut you must not kick, like my good mule, if you make a had swap. 'Oh,' said he, 'I am the best judge of a mule in Callahan.' And I guess he is, for I put my hlanket and saddle on his cayuse and got on. He started off, went ahout ten yards and froze stiff. I kicked him in the rihs, hut he was a rock—like what you call 'in place.' The man from Callahan he nearly had a fit laughing, and he said: 'What you waiting for? You've said good-hye, Greaser; why don't you get a move on you?' I said: 'I'm only waiting to see you move first.' Well, that man from Callahan he led Quo Vadis up and he put on his packsaddle. Never did I see that mule so gentle. He put on his sack of flour, his spuds, his camp kit and tools, and he threw over all the diamond hitch. Then he turned to me, and took off his hat and he said: 'Good hye, my Portuguese sucker; I will he hack here in a month and if you have any fine mules to trade, I will—' But just then his frypan slipped and rattled, and they were 'off in a hunch.' I never saw that mule so active. He was up and down like a jumping jack, and the man from Callahan yelling 'Whoa! whoa!!' and going round and round at the taut end of the lariat. Pretty soon one of the ropes cut through the sack of flour, and they were enveloped in a cloud of white. Then spuds hegan to fly out at tangents, and occasionally a pot or a pan. The man from Callahan got the lariat tangled in his legs and went down, and the latigo hroke. The saddle went one way, while the mule hit the hack trail on a dead run. My horse had thawed out during the excitement and we moved off under a cloud of flour dust. The last I saw of the man from Callahan was from the top of the hill. He was rubhing his shins and shaking his fist at me."

* * * * * * * * *

That night, as we sat around the fire in the cahin and smoked our pipes, the rain pattered on the shake roof and sputtered upon the glowing flame as it came down the mud-daubed chimney.

"This reminds me of a night I passed at Wichipec," said Old Joe. "Ever been there? Well, keep away, for I don't like the formation. The Trinity cuts through some heavy serpentines, and I struck a strong pocket trace, and was 'post-holing' and packing my dirt a half mile to water to pan. They hreed hogs and half-hreeds in that valley, and I was 5 miles from my camp with short supplies; hut I did not want to move my 'lares et penates' till I had run up the trace and decided what threw out the gold. As usual, it was a quartz stringer in the serpentine, though I eventually took out ahout two ounces from the pocket. It is there in sack No. 27. It came on to rain heavy, and, having no shelter, I took refuge with an old squawman who was baching it. He had huilt a shack, ahout 8x10 feet, from old sluice lumher, upon a steep side hill, near a spring. The upper side of his cahin rested on the ground, hut the lower side was shored up some 4 feet, and he had grown tired when he closed the ends. The down-hill side was open under the floor. It had a door and a one-pane window; two hunks, one ahove the other, and a dinky little camp stove. The place reeked with dirt; hut it was any port in a storm with me that night, and I had ahout decided to sit up and keep the fire going rather than crawl into the upper hunk. It was coming down hard and cold; so I could hardly blame the hogs for seeking shelter under the shack; hut they were noisy, rooting each other around, and their odor was noisome. The old man was in his hunk, discoursing on 'Injuns, bars and other insects,' and keeping his pipeful of Star plug tohacco lighted hy the aid of a guttering native candle.

"I asked him why he did not close up the lower side of his cabin, for whenever a hog touched the supports it was ominously shaky. 'Wall, them hogs is company fur me.' 'But the fleas! Why, man, the cahin is alive with them.' 'Wall, I reckon fleas ain't no wuss than other crawlers.' I made up my mind not to hrave that hunk, and amused myself looking through the open cracks of the floor at the moving mass heneath. It was prohahly midnight when a bright idea dawned upon me, and, without a moment's hesitation I acted upon it, hut with dire results. The old squawman was snoring away, and I had just taken the pot of hoiling water from the stove to make my sixth cup of tea, when there was renewed commotion among the hogs, and I could catch the faint torso outline of a huge one through the wide crack under my feet.

"I poured the hoiling water upon that hog.

"'Woof-oof-oof!' Away they fled, hut the big one, in sheer deviltry, no douht, holted against a corner post and carried it away. Bump! crash! down came the shack. Grind—slide—bump! and I found myself jammed into a corner, vainly wrestling with the stove. It was pitch dark, and from the bunk came words that were rare, winding up with the query of 'What'ell?' 'Hogs, wind and water,' I replied, sententiously.

"We lay hecalmed, with a list to port of ahout half-pitch. The door was jammed, hut we cut the leather hinges and it opened inward. The shack had slid down hill some 20 feet and hrought up against a huge houlder, which surely had saved us from avalanching. It was simply pouring rain; so we crawled into the shack and prayed for morning, the squawman condemning hogs, rain and prospectors impartially. The next day we straightened up the shack and I put things more ship-shape for him; hut he had a grouch and nursed it.

"A few days later he came to my camp and asked: 'Say, you ain't seen no painter round here? Ain't seen no tracks? Well, you'd hetter he keerful he don't pack you off. He tried to get Canyon Mary's hig hog, hut she drove him off with a cluh—not before he clawed the hog's hack up pretty had. The squaw's man, Charley, just told me, and he's 8 feet long.'

"'Who? Canyon Mary's man?'

"'No, you fool pilgrim; the catamount.'"

* * * * * * * * *

We smoked in silence for some time, and, in answer to their inquiring looks, I said:

"Well, I have not swapped any horses, and I have scalded no hogs on this trip, but I had a hand-to-hand conflict with a full-grown hear that, for intense excitement and temporary heart failure, was the real thing as long as it lasted.

"I ran across a ledge of talc-hearing telluride near Know Nothing creek, and, before I wasted any needless work, I put up a hluff 'Notice of Location' and took my pan concentrates to Bennett's to he mailed for assaying and classification. It proved to he nagyagite. Look it up, Joe, and we will assay my general samples to-morrow. You hoth know The Forks, hut the day I arrived was a red letter one. They had three fights, a squaw hair-pulling match, and a new papoose. A whiskey drummer had strayed in and a yellow-legged Pine street expert had arrived for his company. These two had incautiously bolted a few jolts of native red-eye, and their inner men were ready for fight or footrace. You know the kind of forty-rod they make and sell.

(Manuel rolled his eyes and moistened his parched lips at the very memory.)

"It has the flavor of tobacco juice and cayenne, and is strong in the houquet of hurnt sugar. The yellow leg expounded the Cretaceous, Jurassic and Glacial, and the whiskey drummer sat in a skin poker game. The natives who could not work into the tinhorn circle surrounded the expert with open and drooling mouths, knowing that if they let him do all the talking the fire from within would soon dry up his salivary glands and a 'shout' would follow. He mixed up 'chalcocalcites' and 'mortified porphyrites' till his voice grew husky, and they carried him aloft, sound asleep. I was reckless enough to take two drinks, and that night about 1 o'clock I awoke with 'fever in my blood.' My mouth was parched and my head throhhed. I hustled into my clothes and rustled for water. It was pitch dark, and I harked my shins and fell flat over a man stretched out on the porch. Nothing short of the river appealed to me, hut when I came to the corner of the huilding I heard the music of flowing water in the hack yard. Talk ahout the 'chink of the ice in the pitcher,' give me an old-fashioned water spout to hold my head under. I cautiously groped in the direction of the stream, humped into a fence, climbed over it, took a few steps, and was enfolded in the hairy clasp of a monster bear. His fetid hreath poured into my face, and it was not the attar of roses. I executed a pas-de-seul in the most approved style, and we side-stepped in a manner enviable; hut, after the first crush, I regained what wind he had squeezed out of me, and realized that it was only play for this tame beast, and that the clanking chain must he fast to a post; hut in which direction was that post? We swayed, and I tried to get a half-Nelson on him; but the trick was evidently old, for he leaned upon me and down we went. I thought every rih in my hody was floating, but I rolled over on my face and played 'possum. This may work on a wild hear; but don't try it, if you are in a hurry, with one trained to wrestling. How many years I crawled around that hear pit, and how many times he wallowed me in a mud hole near the water trough, no one will know; but I remember taking a solemn oath to forever ahjure Injun firewater. Finally he left me of his own accord and I lost no time in crawling out of his reach. I sat there till I regained my breath, then made a wide detour and reached the river.

"Upon my return to the house I ran into the Pine street expert upon the stair, half-dressed and with a candle in his hand.

"'Water—water!' he gasped. Where's water?'

"'If you will take a fool's advice, go to the river,' I replied, and I noticed that he looked at me hard, hatless and muddy as I was.

"I had hardly taken my clothes off when hell seemed to he turned loose in the hack yard. 'Murder! murder! Help! help!' There are five dogs to every native down there, and every cur was in full yap. The coyotes took up the chorus from the hills, and the drunk lying on the porch let off every chamher of his six-shooter. Yellow leg never ceased for a moment, but shriek after shriek rent the night air, for he had undouhtedly fallen into the same trap that I had, though under the disadvantage of having no previous experience with pet hears.

"The entire camp turned out to the rescue, for he was too good a thing to lose; but I turned in, and awoke stiff and lame the next morning to find the expert had already made a sneak, while the drummer was negotiating a loan upon his 'tiamont stud' in order to get hack to civilization."

A CALIFORNIA MINER.

A Power Drill Sharpening Machine.

John and William Word of the Black Oak mine in Tuolumne county, Cal., some months since invented a power drill sharpening machine which they have been successful in introducing in the Michigan copper mines.

The machine weighs in the neighhorhood of 1800 pounds and is operated by compressed air. The sharpening is done by two hammers, one vertical and the other horizontal, each striking a hlow of from 80 to 2000 pounds pressure, as determined by the operator.

The steel being heated, the first process is the rounding of the shank of a drill so as to fit it for the chuck of the drilling machine. The other end of the drill is then put under the vertical hammer and on what is known as the upsetter. The shaping follows and then the sharpening commences. First, the corners are sharpened and then the drill is put under a swage to give it uniform thickness and size. The sharpener puts an edge on the drills not unlike that of a new knife. The end of the drill is cut in the shape of a cross-hit. After the drill has been sharpened it goes through the dollying process, hy which the edge is straightened, and then it is tempered.

The machine is built on a sort of moving anvil, the ohject of which is to permit the changing of the tools underneath the hammer. This is so nicely arranged that it can he moved from one tool to another in less than a second's time. The drill is held by an adjustable dead block which, like the entire machine, is worked hy air pressure. The shaping of the drill is done by means of the vertical hammer, the sharpening hy the horizontal hammer, and the finishing touches are put on hy the vertical hammer.

The great feature of the new machine is the fact that one man can operate it, the hammers being controlled hy a foot lever, a backward motion working one and a forward motion the other. The machine is easy to operate and it is said that under favorahle conditions two drills can he sharpened per minute.

The Cyanide Assay for Copper.*

By H. H. Miller.

In spite of its recognized irregularities, the cyanide assay for copper has always been popular among volumetric methods, being easy and rapid and reasonably accurate when the solution tested contains nothing but pure copper and ammonium salts. In order to secure this condition, however, especially in operating on low-grade ores, tailings and slags of complex composition, it is the practice to precipitate the copper from the ore solution, usually by means of metallic zinc or aluminum. The copper thus precipitated in the metallic form must be dissolved again; and the separation is never, in practice, complete, since an appreciable amount of the copper remains behind in the first solution, and the second solution always contains some of the other metals of the gangue; so that the result is at best but partially satisfactory.

On the other hand, if this course is not pursued, but, as is the practice in many laboratories, the first solution, with or without previous filtration, is treated with an excess of ammonia, and the resulting precipitate of Fe, Al, etc., is filtered off, the difficulties in the way of an accurate assay are still greater. A portion of the copper remains behind in the precipitate, necessitating a second and sometimes a third solution and reprecipitation to secure a precipitate free from copper. Even with this additional manipulation, and consequent loss of time, the results obtained are incorrect. The amount of the standard KCN required to decolorize the solution is affected by varying temperature, varying amount of free and combined ammonia, and volume of solution. The presence of other metals also affects the process. Silver, zinc and nickel, if present, react with the KCN like copper, while manganese retains copper in the precipitate to a greater extent than iron, besides obscuring the end reaction.

Having had occasion recently to make a large number of determinations of very low-grade materials, where it was necessary to know the copper contents accurately to within .01% or .02%, I have employed the cyanide assay with complete success, notwithstanding the difficulties above cited. Careful attention to details and the introduction of a system of comparative standardization have resulted in a method which leaves little to be desired as regards speed of working, combined with a very fair degree of accuracy. The principles involved are: (1) The greatest possible uniformity in every stage of the assay; and (2) the adoption for each particular class of material of a value for the KCN solution obtained by standardizing in the presence of that material.

Details of Working.—The details of an assay or set of assays of material containing from 0.1% to 0.5% of copper are as follows: Ten grams of the ore are weighed into a No. 4 porcelain casserole and digested on the hot plate until complete solution is effected. The acids used, degree of concentration, time of heating, etc., will depend on the nature of the ore; and each operator will determine these features for himself, bearing in mind, however, that in this, as well as in all subsequent operations, what is once adopted must be strictly adhered to in every assay of the same class. When solution has been effected, the sides of the dish are rinsed down with a stream of hot water and the proper amount of dilute ammonia is added, the contents of the casserole being well stirred before and after the addition of the ammonia. The assay is then returned to the hot plate, heated moderately for five minutes, and then filtered hot through a 7-inch filter into a narrow beaker of 250 c.c. capacity. Nearly the entire contents of the dish can be poured out at once onto the filter and the balance is sluiced out with a stream of cold water. The mass on the filter is washed twice with cold water, the jet being forced with the full power of the lungs, so as to stir up and wash the precipitate thoroughly with the minimum quantity of water. The liquid filters rapidly, and the clear blue filtrate, after two washings, should now be almost cold—not over 70° F; and, if the washing has been properly performed, the bulk should not be over 180 c.c. If it be less than this, more water should be added. It is convenient to have a strip of white cardboard bearing the 180 c.c. mark for the size of beaker used. By standing this strip alongside of the beaker, the volume of the solution can easily be measured.

The solution, if cool and of the proper volume, is now ready for assay. Place the beaker under the burette on a square of white filter paper. Run in the KCN solution rapidly, stirring vigorously meanwhile. As the color fades, proceed more slowly and cautiously, adding the standard solution in drops, instead of a continuous stream, as at first. If the ore solution contains manganese, a precipitate will begin to form as the color fades from blue to violet. This precipitate, which appears in the form of a dirty bluish green or brown discoloration, obscures the end reaction, and must be removed by filtration before the finishing point is reached.

Keep the attention fixed on the side of the beaker, near the bottom, looking down transversely through the cloudy solution. As long as a decided tint of violet can be seen on the mirror-like surface of the glass, the cautious addition of KCN can be continued, drop by drop. Stop before this color becomes too faint, and filter rapidly through a thin filter paper. Washing is unnecessary, as the solution is now too close to the finishing point for the trace of copper absorbed by the filter to affect the result appreciably. The filtered solution, which should be very light blue or pale violet in tint, can now be easily brought to a delicate, hardly perceptible rose pink, which should be the finishing point for weak solutions. For solutions containing much copper, it is necessary to finish with a more decided pink, since it takes a little longer for the last color to fade from a solution which was ripe in color at the start. Where no manganese is present, refiltering will usually be unnecessary, the solution remaining clear to the finishing point. A considerable excess of manganese may cause trouble in the assay, especially in the presence of ammonic chloride, as the precipitated hydroxide then forms very slowly and keeps making its appearance as a milky discoloration in successive filtrates. This can be very largely prevented, however, by the presence of sufficient iron, as the iron precipitate seems to carry with it all but a trace of the manganese.

A little longer heating after the addition of the ammonia also aids in securing a filtrate free from disturbing quantities of manganese.

Standardizing the Potassium Cyanide Solution.—From what has been already pointed out, it will be clear that the amount of KCN necessary to discolorize the solution does not give the true amount of copper present in the ore, when the latter contains other bases which interfere with the assay. When the acid solution is precipitated with excess of ammonia, Ag, Ni and Zn, if present in the ore, go into the solution and react like copper with the KCN; while Fe, Mn and Al are precipitated as hydroxides. This precipitate invariably contains a small portion of the copper which, in the case of iron, is probably mechanically retained; but where manganese is present there is a further retention, possibly as a manganate.

Arsenic may also form an insoluble arsenate, and Cr also interferes.

In looking for a way to obviate these difficulties, I began by assuming that the amount of copper retained by these causes combined, varied directly as the ratio of the total copper to the disturbing elements present. Experiment proved this assumption to be a true one, at least to a very close approximation, and this fact, once established, the course of procedure became clear.

In standardizing the KCN solution for any particular ore or class of ores of the same composition, two portions of ten grams each are weighed out for separate assays. To one of them is added a weighed amount of pure copper and the two are run together, being treated in all respects like regular assays. The difference in the number of c.c. of KCN used in the two assays represents an amount equivalent to the weighed excess of copper taken, and from this the true value of the ore is readily ascertained. Operating on the same weight of identical gangues, this figure (with frequent checking) is used. For a different gangue, or a different weight of the same gangue, another test must be made; and whenever an accurate determination of a new ore is required the assay is run in duplicate, as above described.

If due attention is paid to the above details, I believe the cyanide method will prove itself superior to the iodide volumetric method. The latter is certainly no quicker and consumes much larger quantities of chemicals, besides being subject to many sources of error. The colorimetric assay, an improved application of which has been described by J. D. Audley Smith in a recent paper before this Institute, is adapted to low-grade ores only, and for these does not seem to possess any advantages over the cyanide method, either in point of time or accuracy of results.

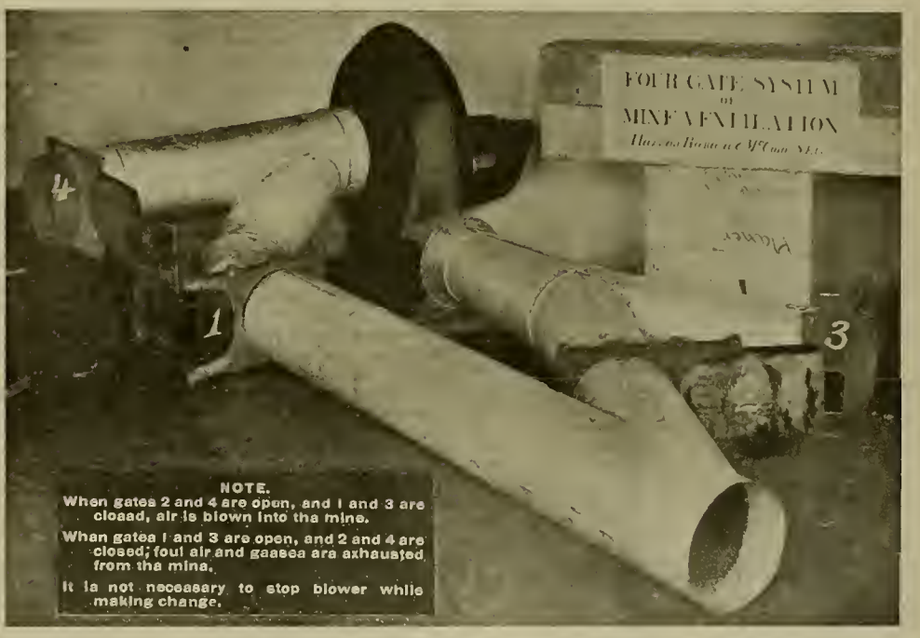
By effecting the solution in acid on a thick asbestos pad, heated by gas or gasoline burners, a number of assays can be run through at once, requiring little or no attention from the time they are placed on the fire until they are ready for the addition of ammonia. The "mixed acid" used is kept prepared in quantity and so is the dilute ammonia. For measuring out the portions of acid and ammonia for each assay the most convenient vessel is a graduated cylinder of 100 c.c capacity, with a foot.

The same method can be applied with equal success to richer ores, as well as to concentrates and mattes. For low-grade ores, containing not over 1% of copper, the KCN solution should not be stronger that 1 c.c. = 0.005 grams of copper. For richer material a solution of twice this strength can be used to advantage.

*Trans. American Institute Mining Engineers, Mexican meeting, November, 1901.

Quadruple Gate System of Mine Ventilation.

The illustration herewith shows the essential features of a system of mine ventilation devised and introduced by Harron, Rickard & McCone of San Francisco, Cal., some six or eight years ago, and which in operation has been found very efficient. This system


FOUR GATE SYSTEM
OF
MINE VENTILATION
4
1
3
NOTE.
When gates 2 and 4 are open, and 1 and 3 are closed, air is blown into the mine.
When gates 1 and 3 are open, and 2 and 4 are closed, foul air and gases are exhausted from the mine.
It is not necessary to stop blower while making change.

enables the engineer to drive fresh air into the mine or draw the smoke out by simply manipulating the gates and without stopping the fan, as may be signalled from below. In the cut it will be noted that the blast gates are numbered, and that gates Nos. 2 and 4 are open and Nos. 1 and 3 are closed, which is the position of the gates when driving air into the mine. By closing Nos. 2 and 4 and opening Nos. 1 and 3, the fan will exhaust or draw the air out. All mine operators will appreciate the importance of drawing the smoke out of the shaft or drift as soon as the blast is fired, and not to blow the smoke out through the shaft and thus distribute the foul air through the entire working. After the foul air has been drawn out, the air current can be reversed and the pure air forced to the point where it is mostly required. Detailed information may be had from Harron, Rickard & McCone, 21 and 23 Fremont St., San Francisco, Cal.

The bill to adopt the weights and measures of the metric system as the standard for the United States, as introduced by Representative Shafroth of Colorado, has been ordered favorably reported by the House Committee on Coinage, Weights and Measures. It provides that after Jan. 1, 1904, all the departments of the Government of the United States, in the transaction of all business requiring the use of weights and measurement except in completing the survey of public lands, shall use only the weights and measures of the metric system, and after Jan. 1, 1907, the weights and measures of the metric system will be the legal standard weights and measures of and in the United States.

At the University of Michigan it has been made obligatory for engineering students to spend six months between the junior and senior years in work. The civil engineers will put in the time in field surveying, the mechanical engineers will do engine designing, the electricians will do foundry work, and the chemists will study dynamos and engines.

Adiabatic Expansion and Compression of Gases.

Written for the MINING AND SCIENTIFIC PRESS by H. D. DIBBLE.

In number nine of the current volume of the MINING AND SCIENTIFIC PRESS we told how to find the ultimate velocity of gases, by the heat given up in their expansion. In this article we will furnish the means of finding the temperature of adiabatic compression and expansion of gases, and this without the use of anything more than the mere rudiments of ordinary arithmetic. For this purpose the tahle given below has been computed from the formula:

$$\text{Log.} \frac{P^1}{P} \times \frac{2}{7} = \text{index logarithmic ratio,}$$

where P^1 is the greater pressure. Owing to a slight difference in the specific heat of air at different temperatures and pressures the formula does not at all times give results that are perfectly correct, but the limit of error is well within the requirement of good engineering practice:

Gauge Pressure.	Atmospheres.	Logarithmic Ratio.	Gauge Pressure.	Atmospheres.	Logarithmic Ratio.
10	1.69	1.16	76	6.17	1.68
11	1.74	1.17	77	6.24	1.68
12	1.81	1.18	78	6.31	1.69
13	1.88	1.20	79	6.38	1.69
14	1.95	1.21	80	6.44	1.70
15	2.02	1.22	81	6.51	1.70
16	2.08	1 23	82	6.58	1.71
17	2.15	1.24	83	6.64	1.72
18	2.22	1.25	84	6.71	1.72
19	2.29	1.27	85	6.78	1.72
20	2.35	1.28	86	6.85	1.73
21	2.41	1.29	87	6.92	1.73
22	2.49	1.30	88	6.98	1.74
23	2.56	1.31	89	7.05	1.74
24	2.63	1.32	90	7.12	1.75
25	2.70	1.33	91	7.19	1.75
26	2.76	1.34	92	7.26	1.76
27	2.83	1.35	93	7.33	1.76
28	2 90	1.35	94	7.39	1.77
29	2.97	1.36	95	7.46	1.77
30	3.04	1.37	96	7.53	1.78
31	3.10	1.38	97	7.60	1.78
32	3.17	1.39	98	7.66	1.79
33	3.24	1.40	99	7.73	1.79
34	3.31	1.41	100	7.80	1.80
35	3.38	1.42	105	8.14	1.82
36	3.44	1.42	110	8.48	1.84
37	3.51	1.43	115	8.82	1.86
38	3 58	1.44	120	9.16	1.88
39	3.65	1.45	125	9.50	1.90
40	3.72	1.45	130	9.84	1.92
41	3.78	1.46	135	10.18	1.94
42	3.85	1.47	140	10.52	1.97
43	3.92	1.47	145	10.86	1.98
44	3.99	1.48	150	11.20	1.99
45	4.06	1.49	155	11 54	2.01
46	4.12	1.50	160	11.88	2.02
47	4.19	1.51	165	12.22	2.04
48	4.26	1.51	170	12.56	2.06
49	4.33	1.52	175	12.90	2.08
50	4.40	1.53	180	13.24	2.09
51	4.47	1.53	185	13.58	2.11
52	4.54	1.54	190	13.92	2.13
53	4.61	1.54	195	14.26	2.14
54	4.68	1.55	200	14.60	2.15
55	4.74	1.56	205	14.94	2 17
56	4.82	1.57	210	15.28	2.18
57	4.88	1.57	215	15.62	2.20
58	4.95	1.58	220	15.96	2.21
59	5.02	1.58	225	16.30	2.22
60	5.08	1.59	230	16.64	2.23
61	5.15	1.60	235	16.98	2.25
62	5.21	1.60	240	17.32	2.26
63	5.28	1.61	245	17.66	2.27
64	5.35	1.61	250	18.00	2.28
65	5.42	1.62	255	18.34	2.29
66	5.49	1.63	260	18.68	2.31
67	5.55	1.63	265	19.02	2.32
68	5.62	1.64	270	19.36	2.33
69	5.69	1.64	275	19.70	2.34
70	5.76	1.65	280	20.04	2.35
71	5.83	1.65	285	20.38	2.37
72	5.90	1.66	290	20.72	2.38
73	5.96	1.66	295	21.06	2.39
74	6.03	1.67	300	21.40	2.40
75	6.10	1.67	305	21.74	2.41

Air at 60° F. is compressed adiabatically to 100 pounds gauge pressure, what will be its temperature? Looking in column one under gauge pressure we find the number 100, and opposite it in column three we find the logarithmic ratio to be 1.80; then multiplying the absolute temperature 60 plus 460.66 or 520.66 by 1.80 we get 937; subtracting 460 we have the answer, 477° F.

Air at 75 pounds pressure and 60° F. expanded to the atmospheric pressure, what will be its temperature? Looking in column one we find the number 75 and opposite that in column three we find the ratio to be 1.67. In this case we divide the absolute temperature 520.66 by 1 67 which gives us 311, which subtracted from 460 gives the answer —149° F.

A gas engine with a compression chamber of one-third and a stroke of two-thirds, what will be the temperature and pressure of the compression? In this case the compression isothermal will be three atmospheres absolute. Looking in column two under atmospheres we find the number 3.04, which is near enough for our purpose, and the ratio that corresponds is 1.37; multiplying by the absolute isothermal pressure, 43.1 pounds, we get 59 pounds absolute or 44.3 gauge pressure. The explosive mixture before compression consisted of two-thirds air and gas at 60° F. and one-third the spent gases of the previous explosion of say 1000° F., giving to the charge the temperature of 373° F. or 833 absolute; multiplying by the same ratio as before gives us 1141 absolute or 681° F.

In the same cylinder, the temperature being 2681° F. and the gauge pressure 150 pounds per square inch, what will be the temperature and pressure at end of the working stroke? The expansion being from one to three we use the same ratio, 1.37, the exhaust pressure isothermally would he 50 pounds per square inch; dividing the absolute pressure, 64 7, by 1.37 we get 47.2 absolute or 32.5 gauge. The temperature, 2681° F. or 3141 absolute, divided hy 1.37 gives 2292 absolute or 1832° F. at the pressure of the exhaust; when expanded to the atmosphere the heat of the spent gases would be 1083° F.

A Suggestion.

TO THE EDITOR:—In some solvents of gold, the action of nitrogen appears to be only a presence action, a pusher, or assembler of favorable conditions. This action, if investigated by some person having the necessary skill and laboratory requisites, might result in the discovery of a solvent or solvents of gold of far greater industrial value than any solvent now used.

Permit me to use the word nitro, as a general term for any compound in which nitrogen is present, and N as its symbol; and also to write the formulas of three entirely different kinds of solvents of gold, thus:

Aqua regia.....HCl+N
Per iodide of nitrogen.....I+N
Cyanide of potassium.....KC+N

Aqua regia is the standard solvent for gold; it is quick in action, and carries a large load. Hydrochloric acid is a very slow solvent of gold, satisfied with a very small load even when boiling hot; add nitro, the solvent action is instantly pushed to its highest power. The product is chloride of gold; no trace of nitrate of gold is present. The actual operation of the nitro we do not know; it is said to supply oxygen, which forms an oxide that is taken up hy the chlorine.

Iodine is a slow solvent of gold; add nitro, and it rivals aqua regia in rapidity of solution. The product is iodide of gold; no nitrate of gold is present, and the nitro in this case does not carry oxygen.

Potassium carhonate is not rated as a useful solvent of gold; add nitro, and we have cyanide of potassium. The product of this solvent of gold we call cyanide of gold; what is that? Is there nitrate present, or is it as before, in the other cases, that the nitro has only had a presence action, forcing a solution by the KC?

All reports of users of KCy as a solvent for gold show that it is irregular in its action of both dissolving gold and in holding it in solution. This fault may be not so much in impurities present as in the absence of a sufficiency of some at present unknown item which the suggested investigation might discover. As a hint to the investigator, the following may be useful: Ahout ten years ago I was making some experiments in this line, using a thick gold foil, 995 fine. In one instance a piece of this foil, after two weeks' immersion in a solution of cyanide, showed no visihle diminution. I added a few drops of iodine; eight hours later the gold was all dissolved. Per cent of cyanide to water I do not remember, but think it was 5%.

Cyanide will instantly dissolve chloride of gold, and will carry a large load of it. It may have industrial possihilities as a solvent and carrier of gold far beyond our present idea of it. JOSEPH VOYLE.

WORK will soon begin on the first public land survey in Alaska. A. J. Adams of Valdes, formerly in charge of the hydrographic work of the United States Geological Survey in Washington, has been awarded the contract to run a base line through the Copper River valley preparatory to opening a tract of agricultural and grazing land in the valley. It is estimated that within the Copper river watershed there are 30,000 square miles of good farming and grazing land. The soil is described as loamy and easily cleared. The hills and valleys, it is reported, have growths of red top and bunch grass that makes fine hay. There is an ahundance of timber. The contract which Mr. Adams has secured is for establishing "the hase lines, meridians and standard parallels for Alaska in the Copper River valley." The total length of the lines is 200 miles, and after they are once established the township subdivision surveys will be made.

Splices.

The meanings of the terms "three-wire splice" and "Western Union splice" as commonly used in describing electric line work are as follows:

In the first place, the term "Western Union" is something of a misnomer in this case because the ordinary telegraph splice was used long before the Western Union Company was organized.

As the Western Union Telegraph Company, however, was for a number of years the only large company in existence that made a business of putting up wires, the ordinary telegraph splice, made by twisting the two ends of the wires around each other, became known among linemen as the "Western Union joint." It would be better to speak of it as the common, or ordinary, splice. It is shown in Figure 2.

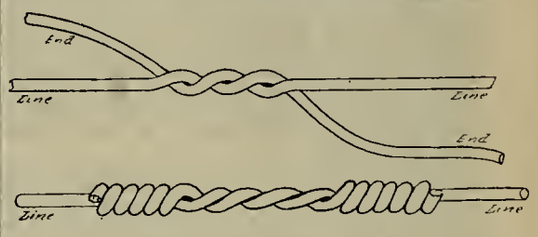


Fig. 2.—Ordinary Splice.

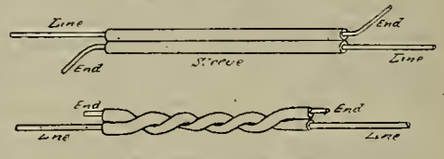


Fig. 1.—Sleeve Connection.

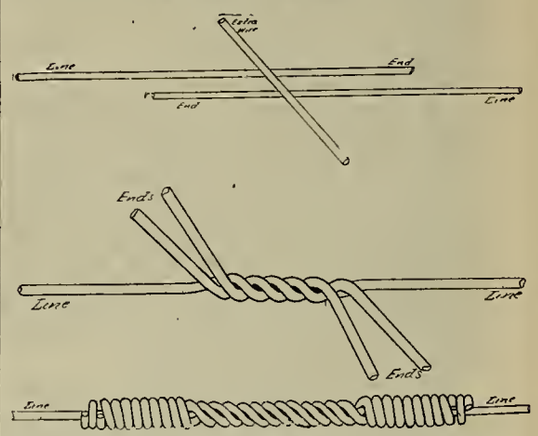


Fig. 3.—Three Wire Splice.

The three-wire splice has come into existence within the last ten years, and became necessary owing largely to the fact that copper wires cannot be twisted ("cinched," to use a colloquialism) as tightly as an iron wire joint. It was also found that the introduction of a third wire into the joint greatly decreased its electrical resistance so that a connection of this kind possesses a lower resistance than even the well-known copper sleeve splice, illustrated in Figure 1.

The various processes of making a three-wire joint is shown in Figure 3. The ends of the wire are made to pass each other the same as in the ordinary splice. A third wire from 8 to 12 inches long is also placed alongside of both of them, and all three are then clamped in the middle by the ordinary clamp connectors and twisted around each other in the same manner as in the ordinary joint, except that there are two ends to handle on each side of the center instead of one as in the ordinary splice.

A joint made in this manner is much stronger than the ordinary kind and it is not necessary to twist it quite so tight in the center, while it also, as said before, possesses a lower electrical resistance.—Am. Telephone Journal.

THERE seems a probability that before many more years have passed many of the water powers of the western mountains will be applied to the operation of the railways that traverse them. An experiment in Switzerland indicates this. The Thum-Berthoud trolley railway consists of 24.8 miles of steam railway which was converted in 1899 into a trolley system. The electric energy is obtained from water power. Electric traction was adopted for economical reasons. When operated by steam the annual cost of coal was 52,000 francs for five trains daily each way, and 10,000 francs for each additional train. With electricity the same expenditure has enabled the company to run ten passenger trains of equal capacity to those operated by steam and two freight trains daily each way.

Electrolytic Recovery of Copper From Low-Grade Ores.*

By N. S. KEITH.

Low-grade cupriferous rocks are those which contain such small amounts of copper per unit (say a ton) of weight that a large number of such units must he treated daily to make a commercial profit.

Where lahor, fuel, power, supplies and such requisites are cheap and the market for the product is near at hand, the percentage of the yield of copper may evidently he less than in cases where expenses are higher, as in regions remote from civilization and the market.

Low-grade ores may, then, also he defined as those which contain from 1½% to 5% copper, with favorahle conditions in inverse proportion.

Some low-grade cupriferous rocks may carry enough gold or silver, or both, to make them valuahle for treatment for recovery of all of the metals when the amount of copper recoverahle alone would he unremunerative.

There are two methods—the dry and the wet—hy which low-grade cupriferous rocks are treated. In this paper I am to consider hut one—the wet. There are varieties of the wet method, but I will confine myself to the one variety in which electrolysis is used to effect the final deposition of the copper ohtained in solution during the procedure.

There are many varieties of copper ores which may he treated metallurgically hy the wet method, but with many variations which the limits of this paper will not permit of consideration.

A rehearsal of the conditions and considerations applied hy the author in the planning and erecting of works for the electrolytic method of recovering copper from the ores of a mine a few miles from New York City may he interesting and instructive. These are the conditions:

The mine was worked intermittently from 1715 up to 1863, sometimes at a profit and sometimes at a loss, hut always hy methods crude and antiquated compared with those at present pursued in the art. All of the rock contains some copper, hut there were—and are—in it streaks, seams, veins, etc., which carry values up to 70% of copper, though these serve hut to leaven the whole to the value of ahout 2%, or 40 pounds of copper to the ton, thus making millions of tons of low-grade copper-hearing rock which may hy scientific mining and milling he profitahly worked.

Prior to 1863 the miners sunk shafts and ran drifts in this rock without any apparent system, in the evident search for the richer ore seams, streaks and veins which I have mentioned. Whether they made or lost money depended upon their luck in finding more or less of these richer portions.

Modern methods frequently warrant the working of nearly or quite all of such rock containing disseminated rich ores rather than hy picking out only the richer portions, solely for treatment, and throwing the major parts onto the waste dump pile.

The ores impregnating the rock are chalcocite (copper glance), Cu_2S (copper 79.8%, sulphur 20.2%); malachite (green copper carhonate—copper 62%); azurite (hlue copper carhonate—copper 61%); cuprite (cuprous oxide) Cu_2O—copper 88%), and some oxides of iron.

The rocks—called hy miners "gangue"—in which these ores are found are of several kinds, mainly sandstone, of the Triassic period; trap, cutting the sandstone in all directions and frequently overlying it; hreccia, indurated clays and shales. I will not attempt to theorize as to the origin of the copper contents of these rocks. They lie in a hed having a thickness varying from 20 to 60 feet, dipping westerly at an angle of ahout 9° from the horizontal. The mining is cheaply done and the rock is dumped directly into the mill from the ore skip, which is hrought from the mine hy means of an electric hoist and runs hack into the mine hy gravity. The scope of this paper does not admit of the consideration of the mining methods.

The prohlem for the metallurgist was to ohtain the copper contents of the rocks, after they were landed in the mill, in the cheapest and most expeditious manner. This was decided to he hy dissolving the copper and depositing it from the solution hy electrolysis.

In order to prepare the rock for treatment hy solvents it is passed through the following operations:

As the rock is raised up the incline from the mine hy means of a skip it is automatically dumped into the hopper of a Gates type of crusher, which hreaks the rock to the size of ahout ¾-inch to 1-inch cuhes, and smaller. Three minutes suffice for this operation on one skipload of 1½ to 2 tons.

All of the machines of the plant are run hy means of motors obtaining their current from a direct-current generator of 300 K.W. at 240 volts, direct connected to a tandem compound condensing engine. This generator also supplies the current for the electrolytic vats.

The hroken rock falls from the crusher into a steel hin holding about 400 tons. This steel hin has its hottom inclined so that it may he emptied hy gravity through gates on the side at the lower edge near the bottom.

The rock coming from the mine is damp, containing ahout 8% to 10% of water. Of necessity it has to he dried hefore further reduction in size. This is accomplished hy forcing heated air or furnace gases through the hody of orc lying in the hin. This has been found to be an economical and effective way of drying.

From the hin gates the rock is moved in a constantly flowing stream, hy means of a feeder helt, to a set of crushing rolls, which further reduces the sizes of the pieces of rock to that of peas or heans, and smaller—even to sand and dust. This is then elevated and caused to run hy gravity over inclined wire cloth sieves, called "separators," which separate the sand and dust for the next step of treatment. The coarser pieces which do not pass through the meshes of the sieve run into pulverizing machines, which reduce them to the size at which they pass through the sieve when again run over the separators. The rock is thus crushed, ground and pulverized so that it will pass through the meshes of a No. 30 wire cloth having 900 holes to the square inch.

This degree of comminution is necessary in order that the particles of copper ores impregnating the rock may he set free, or exposed, so that they may he acted upon hy the agents used in the next steps of the operation. These steps are roasting and lixiviation.

While the oxides and carhonates of copper are readily soluhle in dilute acids, the cuprous sulphide or chalcocite is not. Even strong and hoiling sulphuric—or hydrochloric—acid will not dissolve it. Boiling or hot nitric acid will. But the use of nitric acid is not admissihle for other reasons than its expense.

Therefore it is necessary to decompose the chalcocite hy expelling its sulphur and oxidizing its copper. This can hest he done hy roasting. The roasting takes place continuously, as the rock comes from the pulverizers, in a mechanical furnace having a hearth 200 feet long hy 10 feet wide, and fired hy coal in seven fireplaces arranged along its sides. Rahhles, or rakes, are caused to continually travel from end to end of the furnace, in their course stirring the powdered rock, exposing continually renewed surfaces to the action of heat and atmospheric oxygen, and moving it to the discharge end. From the discharge end the roasted rock is conveyed to the lixiviation or leaching tanks. The capacity of this furnace is ahout 125 tons of powdered rock per day of twenty-four hours.

The reactions which take place in the furnace are these: The carhonates of copper are decomposed, setting free CO_2, and their copper contents oxidized to CuO; the chalcocite is decomposed, the sulphur set free and oxidized, and its copper contents oxidized to CuO; the ferrous carhonates are decomposed and the oxides are further oxidized, which makes them less soluhle in dilute acids. The roasting of chalcocite (Cu_2S) does not produce any $CuSO_4$, as in roasting other copper sulphides—for instance, chalcopyrite, containing CuS. There is not sulphur enough in Cu_2S to supply the equivalent of S to form $CuSO_4$. The sulphur of the chalcocite either escapes with the gases of the furnace or unites as SO_3 with the earthy alkaline constituent of the rock—lime—as calcium sulphate.

There is some calcium carhonate, as calcite, in the rock, say ahout one-half of 1%. In order to economize in the use of acid it is necessary to mix with the rock as it passes into the furnace some powdered sulphide ores, preferahly carrying at least a small percentage of copper, which copper is recovered in the suhsequent steps of the process. This is an economic feature, hecause such ores are cheaply purchased and serve the douhle purpose of supplying sulphur to he oxidized and unite with the lime as $CaSO_4$, and a means of ohtaining their copper contents. Sulphur may he used in the same manner for the purpose of neutralizing or counteracting the lime. When sulphide—or sulphur—is used in the roasting much of the copper is sulphated, and as $CuSO_4$ is readily dissolved in water.

The practical result of the roasting is a powdered rock having disseminated therein some $CuSO_4$, some CuO, and some FeO and Fe_2O_3, the last of which list is practically insoluhle in the acid used.

To extract the copper contents the solvent used is primarily $H_2SO_4 + x\ H_2O$. HCl may he used as a solvent, hut there is a difficulty in ohtaining anodes which will not seriously deteriorate in the suhsequent electrolysis. The percentage of H_2SO_4 is determined hy the amount of solvent. The amount of H_2SO_4 may vary from 5% to 15% of the water of the solution.

As will he described further on, after the primary use of the solvent ($H_2SO_4 + x\ H_2O$) another solvent of the copper oxide takes part in the action, namely, $Fe_2(SO_4)_3$—ferric sulphate.

From the roasting furnace the rock is conveyed to one of four leaching tanks, filling them in succession. Each tank is cylindrical, 30 feet in diameter and 6 feet high, inside measurements. They hold 125 to 150 tons of the powdered and roasted rock. The rock is put in hot as it comes from the furnace.

In the hottom of each tank there is a filter hed of coarsely crushed rock, covered with canvas, which is calked tightly around the edges and around the outlets through which the powder is washed after the extraction of its copper contents.

From the center of the hottom of each tank, under the filter hed, a pipe, with a stop cock, serves through which to draw off the solvent to the electrolytic cells.

During the filling of each tank a suitahle amount of the solvent is admitted to moisten the rock, and finally, when filled to within ahout a foot of the top, the whole is flooded hy the solvent to the depth of a few inches ahove the hed of powdered rock.

The solvent hegins to run from the hottom of the first filled leaching tank as soon as filled, running through the filter hottom in a stream of perfectly clear greenish hlue liquid. From time to time, as the liquid on the top is lowered to the surface of the rock a few inches in depth, more of the solvent, drawn from the "stock solution tank," is run in.

The first solvent run in during the filling of the tank takes up nearly all of the copper, and runs out at the hottom fully saturated with $CuSO_4$. As the fresh additions of solvent pass through the hed of rock they carry decreasing quantities of copper, until all of it has heen taken up, and the solvent running out shows little or no more hy assay than does the solvent run in.

But meantime tanks Nos. 2, 3 and 4 have heen filled, and a like solvent action takes place in them. Then, in order to have a solution of nearly uniform value in copper to electrolyze, the richer liquors from No. 2. are run out simultaneously with the poorer from No. 1. This method is kept up in regular succession with the other tanks.

As soon as the rock in No. 1 has had its copper contents dissolved hy the solvent the outlet is opened and the solution runs into the deposition vats, and as the quantity of copper in the solvent from this tank decreases in amount the outlet of No. 2 is opened to allow a flow of strong solution to mix with that from No. 1, and so on with Nos. 3 and 4, and then from a new charge in No. 1, and so on, in a continuous cycle of operation. This procedure is for the purpose of supplying the deposition vats with a steady stream of lixiviate having constant percentage of copper.

The tanks are emptied hy opening passageways through the filter hed and hottom of each tank and turning a forcihle stream of water, pumped for the purpose, against the depleted powder, then called "tailings," thus washing them out, after the manner called hydraulicking in some kinds of gold mining.

The deposition vats are rectangular hoxes of wood, protected from the action of the lixiviate, now the electrolyte, hy a suitahle lining. They are arranged so that the electrolyte flows from No. 1 through Nos. 2, 3, 4, et seq, and finally out of No. 128, depleted of its copper, into a large tank called the "sump," from whence it is pumped up into the "stock tank" for re-use.

These deposition vats are so set, at different elevations ahove the floor of the huilding, that the electrolyte runs hy gravity from one to the next, and so on through the series to the end, through troughs, or spouts, hetween their ends, with this exception: As the vats are arranged in six rows, and one end of each row is at a greater elevation than the end next to it of the preceding row, it is necessary to raise the electrolyte from the one row to the next at those points. This is done hy means of air-lift pumps, which are easily managed.

The electrical connections are as follows: The electrodes in each vat are connected in multiple, and the several vats of electrodes are connected in a series of 128—exactly, so far, as is the case in large storage hatteries.

But for the purpose of insuring a retrogressive decrease of density of current at the electrodes of each vat, after the first of the series, the numher of electrodes is increased progressively from the first to the last of the series. The amperes of current are the same in each vat of the series, hut the current density is less and less in decremental order from the first to the last of the series, to compensate for the decrease of copper in the electrolyte in its course through the vats. Thus the density of current may he 15 or 20 amperes per square foot of cathode surface with a 6% copper solution, and 3 amperes per square foot with a 0.5% solution, provided proper circulation and sufficiently rapid movement of the electrolyte he kept up hetween the anode and cathode surfaces.

The evolution of free oxygen at the anodes keeps up a continual mixing movement of the electrolyte, in addition to the motion due to the flow through the vats.

During electrolysis there is a counter-electromotive force of 1.6 volt in each vat of the series, due to the difference of energy of comhination hetween the materials on the surfaces of the anodes and cathodes, respectively, and the constituents of the electrolyte. The generator is operated at approximately 240 volts, which gives $240 \div 128 = 1.87$ per cell. The voltage per cell required is $1.87 - 1.60 = 0.27$ volt for the resistance of conductors, etc.

The density of current must not exceed in any vat the limit heyond that required for the deposition of reguline copper.

Primarily both the anodes and cathodes are of sheet lead. But under the electrolytic action the anodes hecome coated with PhO_2, and the cathodes

*American Institute of Electrical Engineers, February meeting.

with copper. As soon as the copper deposit reaches the thickness of thin cardboard it is stripped off each lead cathode, which is then replaced in its cell, and the two copper sheets thus produced have suitable connections riveted to them, and they are then rehung as cathodes in some of the vats, where they remain a sufficient length of time to receive a deposit of copper to the thickness needful for the market.

The author has tested anodes of carbon, both such as are used for battery plates and the Atcheson graphite electrodes. There is much less oxidation and disintegration with the latter, but still too much for economy. There are also some other difficulties incident to the use of carbon. Under proper treatment the lead anodes do not sulphate and the formation of PbO_2 is merely superficial.

A certain proportion of the lead cathode plates is specially used for the purpose, as above, of producing the thin copper cathodes, it being a handier and a cheaper method than providing rolled thin copper sheets for the purpose.

The lixiviate running from the leaching tanks into the deposition vats consists of a solution in water of sulphuric acid, cupric sulphate and ferrous sulphate, expressed symbolically as follows:

$$xH_2SO_4 + 2CuSO_4 + 4FeSO_4.$$

The electrolytic action deposits the copper on the cathodes, perhaps by secondary action, without the evolution of hydrogen, but with the setting free at the anode of oxygen. But some of the oxygen and acid is appropriated by the ferrous sulphate, thus becoming ferric sulphate. When there is enough ferrous sulphate present at the anode no free oxygen is evolved, but is appropriated by the ferrous sulphate to form basic ferric oxide, which unites with the sulphuric acid to form normal ferric sulphate, as per this equation:

$$x\,H_2SO_4 + 2CuSO_4 + 4FeSO_4 = 2Cu + 2Fe_2(SO_4)_3 + x\,H\,SO_4.$$

Taking the latter half of the above equation for consideration, the two parts of copper are deposited on the cathodes and the solution of ferric sulphate and sulphuric acid runs to the sump tank, from whence it is raised to the stock tank, and from there is used on subsequent lots of powdered and roasted rock in the leaching tanks. While the starting of the plant involved the use of a solution of sulphuric acid for the solvent, all subsequent solvent actions take place in the presence of ferric sulphate and ferrous sulphate as well.

Now, ferric sulphate solutions are energetic solvents of metallic copper, oxides of copper and, to a limited extent, of some sulphides of copper, with reduction from ferric to ferrous solutions and ferric oxide. Take metallic copper and we have this equation:

$$Cu + Fe_2(SO_4)_3 = CuSO_4 + 2FeSO_4.$$

Take cupric oxide:

$$3CuO + Fe_2(SO_4)_3 = 3CuSO_4 + Fe_2O_3.$$

This latter equation shows that ferric oxide (Fe_2O_3) is freed by the solvent action in the leaching tank, and remains there undissolved, thus continually purifying the solution of iron.

The roasting process may sometimes fail to completely oxidize the Cu_2S. If so, then the following equation expresses a further action:

$$Cu_2S + 2Fe(SO_4)_3 = 2CuSO_4 + 4FeSO_4 + S.$$

It has been claimed that cupric oxide is dissolved by a solution of ferrous sulphate by double analysis and synthesis, per this equation:

$$CuO + 2FeSO_4 + H_2O = CuSO_4 + (Fe_2O_3 + SO_3) + H_2.$$

The sulphuric acid dissolves some cupric oxide, as per this equation:

$$CuO + H_2SO_4 = CuSO_4 + H_2O.$$

It will be seen that all of the reactions result in the production of cupric sulphate in the lixiviate which is to be electrolyzed. There is no deposition of iron on the cathode, even though its sulphate salts are present in the electrolyte in great excess, say near to the saturation of the solution.

Unfortunately, the expenses of the operation can not now be stated, because not yet obtainable. Just as the plant was starting financial difficulties intervened and caused a stoppage. Enough had, however, been done, in an experimental way, to make positive all of the principles of the process, and that, probably, the expenses of mining and metallurgical treatment need not exceed $2.50 per ton. It is probable that work will soon be resumed.

A COMPANY has been formed in Milan, Italy, for the electrolytic manufacture of caustic soda and of calcium chloride. The works will be at Varallo, using 600 H. P. from the River Sesia. The company expects, with 350 working days of twenty-four hours, to produce 2359 tons of calcium chloride and 2880 tons of caustic soda from about 1806 tons of salt and 1216 tons of quicklime.

The Rocker.

Written for the MINING AND SCIENTIFIC PRESS.

The rocker's field of usefulness in placer mining has widened rather than diminished with the lapse of the years since the early California miners first used it in the '49 days of placer mining in that State. It is everywhere the pioneer of other placer gold saving devices and is always to be found at work on the fringes of the new districts as they develop through sluices into hydraulics and dredgers. It is quite common among those whose ideas of efficiency and utility are limited to a servile awe of mere bigness, to refer slightingly to the rocker as an antiquated, wasteful device for gold saving. The fact is, however, that it is an exceedingly serviceable tool for which no real substitute has yet been invented and is, properly made and in the hands of a real placer miner, a very close gold saver.

The type of the rocker has not changed since it was invented. There are minor changes in details to suit the fancy or convenience of the maker. The sketches herewith show the simplest form of construction and will be found useful to beginners in the search for placer gold. The prospector, be it known, is and should be quite independent of having to buy a rocker. He should know how to make one and should make his own. It is not etiquette among prospectors to borrow rockers.

Figure 1 shows the rocker completed. A is one of

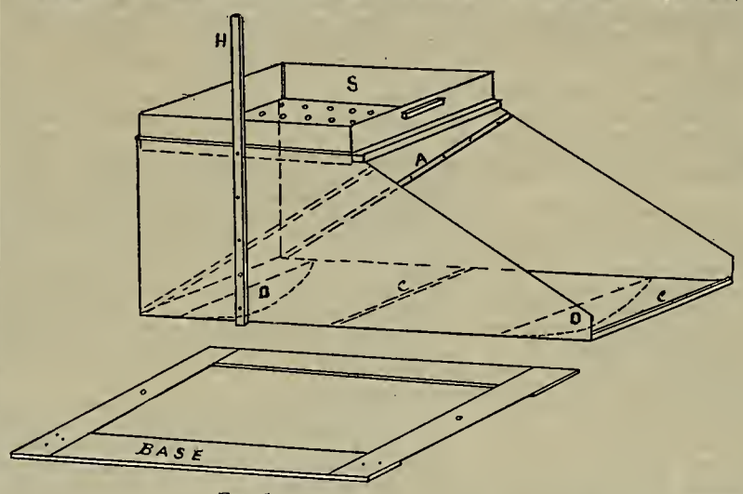


FIG. 1.

two cleats which are tacked inside of the box to hold a removable apron, which is shown in Figure 3; S is a screen hopper into which the gold bearing gravel or wash is dumped. It may be built of 1x4 surfaced board, or ¾x4 if the rocker has to be carried much. The bottom is a perforated sheet of iron or a coarse wire screen with ½-inch perforations. The writer, when nothing else was available, has used the tin of tomato cans to make a hopper bottom.

The hopper sets inside of the body of the rocker, resting on cleats nailed to the side, as shown at B (Figure 2). The apron is a frame of sticks ½ by ¾ inch, nailed strongly at the corners and having the side pieces projecting at the lower ends beyond the lower cross piece. Upon this frame a piece of canvas is tacked with a sag of an inch or so at the lower edge, making a sort of pocket. This sag is shown in the shaded portion of Figure 3. The fine stuff and water coming through the screen bottom of the hopper fall on the apron and a concentration takes place, the coarse gold being held by the pocket in the apron. Some black sand and other heavy minerals are caught here. The apron can be readily removed and its contents washed into a pan for final cleaning. To catch gold that passes the pocket two cleats are nailed crossways of the bottom, as shown at C C. Sometimes the bottom of the rocker is covered with canvas, which assists in saving the very finest flour gold. The handle, H, is in the sketch shown nailed to the side of the rocker box. A mode of attachment that is sometimes found more convenient is to fasten it to the side of the hopper. The latter can then be lifted out of its place and discharged without removing the hand from the handle.

Two rockers, segments of a circle, are nailed to the bottom of the box, forming the rockers on which the box is given the cradle or rocker movement from which the device takes its name. The rocker is set on a base made of four flat pieces of 2x4 or even 1x4. This frame has two holes bored at the middle points of the end pieces to receive the lugs on the bottom of the rockers. The catch of the lugs into the frame keeps the rocker from moving forward with the rocking motion. The frame is stationary, but is given a grade determined from trial.

In operation the hopper is filled with a shovel or two of the soil and gravel and water is poured on it, the rocker being given a rocking motion during the pouring. The soil and fine stuff washes through the screen onto the apron and thence into the bottom, where after passing the riffles it is discharged as tails at the lower end. The hopper, after the gravel is washed clean, is lifted out of its seat and its cleaned gravel discharged. The hopper is then refilled and the process is repeated. The gold and heavy stuff caught in the pockets and behind the riffles is from time to time carefully washed into a pan and worked down till nothing but the gold remains.

FIG. 3. .

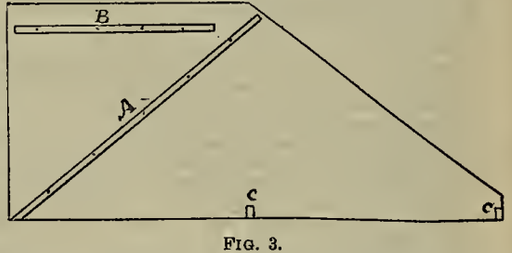


FIG. 3.

"A Marvelous Advertising Medium."

About fourteen months ago this paper published a clever article on "Cyaniding Rock in Place," which set every miner in the west half of America laughing. It was a humorous "take-off" on sundry solemn cyanide subjects, and everyone saw the joke.

Letters still come asking: "Who wrote that?" Under date of the 1st inst., the author of the article writes, saying, among other things:

"Although you buried me under your given pseudonym, 'A California Miner,' I was exceedingly pleased to receive letters from the ends of the world, from old mining chums, who had detected traces of my 'fine Italian hand.' Old Joe (whom I had lost track of for years) wrote from the Seven Devils district, Idaho; Chapman, from the Mother Lode, said: 'I've given it a post of honor in my Cyanide Clipping Book,' and others, nearer, wrote joshingly. I was, however, astonished that your circulation could reach and bring letters from C. A. Fletcher, secretary Apollo mine, Unga Island, Alaska, and from Billy Bell in South Africa—neither of whom have I seen for years. Truly, the MINING AND SCIENTIFIC PRESS is a marvelous advertising medium, when even a man's personality may be detected."

There is probably no part of the earth where mining men thrive that is not visited by this paper. Some time ago an advertiser personally told the writer that he had a $12,000 order for mining appliances from Siam and that the Siam man had written he had seen the advertisement "in the MINING AND SCIENTIFIC PRESS."

A Colorado advertiser writes this week telling that he had a fine order from Antofagasta, Chile, S. A., "secured by an advertisement in the MINING AND SCIENTIFIC PRESS," and the week before came a letter from an Ohio firm saying that a $6000 order from the island of Jamaica had been booked, the West Indian saying he had observed the advertisement in the MINING ANN SCIENTIFIC PRESS.

The best proof, however, of the world-wide circulation of this paper is afforded by the thousands of intelligent subscribers. Let a little misstatement or error occur in its columns, and it is like dropping a stone in water whose widening rings touch the most far-off shores. Some months ago, in "Concentrates," a slight misstatement of metallurgical fact was made. That week came several kindly corrections from California readers, the next came more from points farther East, and since then the inaccuracy has been courteously pointed out and the correct statement given from more distant points. It will probably be the close of the year before such corrections cease coming, for it takes a long time for this paper to get to its readers in some remote parts of Australia, the Philippines, Indo-China, Japan and Siberia, and for a communication to be received back therefrom. Truly, as our correspondent says, "the MINING AND SCIENTIFIC PRESS is a marvelous advertising medium."

Black Warrior Copper Plant, Near Globe, Arizona.

[STAFF CORRESPONDENCE.]

The proposition of the Black Warrior Copper Co. Amalgamated comprises a copper mine, acid plant, crushing mill, leaching plant, matte smelter and refinery. The property is about 7 miles west from Globe, Gila Co., Arizona. Jas. A. Fleming is president of the company, C. E. Colony vice-president, H. A. Fry treasurer, E. L. Tustin secretary, their Eastern office being in Philadelphia, Pa. The mine is about 1 mile from the reduction plant, and the two are connected by a tramline.

In the mine the ore body has a northeast and southwest trend, is between diorite and trachyte walls and is presumed to be on the same belt as that of the Old Dominion and Buffalo at Globe. The property is well opened up through a system of tunnels, open cuts and shafts, showing the ore ledge to run from 20 to 60 feet wide. Manager Fleming states that he has 200,000 tons of ore blocked out. In one place the work extends to 300 feet depth. The ores consist of copper oxides and carbonates, running about 60% silica, and are said to average 7% copper. The ore body is opened at various points for about 1 mile along its strike.

The crushing mill is equipped with rock breakers and rolls, capable of handling 500 tons of ore daily. The mill reduces the ore to ½ inch size and less for the leaching plant. The latter contains fifteen lead-lined leaching tanks, made of redwood, boiled in asphaltum. Each tank has ten tons capacity and is hung on trunions, provided with gearing so as to turn or dump it. Above the leaching tanks is a row of lead-lined acid solution tanks, reaching the ore in the latter from the bottom. On a level below the leaching tanks are a number of steel, lead-lined receptacles into which the exhaust solution is drained. By compressed air it is pumped up to the solution tanks, where it is standardized for use again. The solution is about 10% sulphuric acid, and it is stated thas the requirements are four to five pounds of acid to recover one pound of copper. The copper in solution is precipitated by means of scrap iron within two "copper barrels," each 10 feet long by 8 feet in diameter. The resultant precipitate is about 85% copper, the balance iron. This product of the leaching plant is refined on the ground and ingots of practically pure copper turned out.

One of the features of the work is a plant for manufacturing sulphuric acid from material on the premises, which it is claimed has a capacity of twenty-five to thirty tons of acid per twenty-four hours. The main plant is enclosed in a building 65x 210 feet in size, which contains two lead-lined acid chambers, each 200 feet long, 25 feet wide and 20 feet high; also one niter chamber 35 feet long, 20 feet wide and 20 feet high. In this construction about sixty-five tons of lead were used.

In a building adjacent to the structure just described there are four Herreshoff roasting furnaces, each 11 feet diameter and 10 feet high. Within the furnace are five shelves, extending from a center shaft to the circumference, with apertures next to the outer rim. Sulphide ores are fed from a central hopper above into the several furnaces at the top. The center shaft in each furnace is turned by gearing, and attached to it are rakes that circle around on each shell, stirring the ore and dropping it through the apertures to the shelf below. When the fires are once started in these furnaces the sulphur in the ore is supposed to supply the fuel for continuous roasting. The sulphurous fumes and dust pass from the furnaces to an adjoining dust chamber, thence into ovens in which nitrate of soda is boiled with sulphuric acid to convert the nitrate to a sulphate of soda; and by this the nitrous fumes are liberated and used in condensing the sulphur fumes into the sulphuric acid. The gases from the niter oven pass up through a quantity of quartz within a lead-lined Glover tower, thence through a flue into the main acid chamber. This tower is 10 feet square and 24 feet high. There is a second tower of same size.

Much of the ore roasted runs about 35% sulphur, the cinder, or desulphurized material, containing iron and copper, may be used as a flux in smelting siliceous gold and silver ores. However, a good deal of the material that is high in sulphur is chiefly valuable to the acid plant, as it is not high in anything else except iron. This is mined at an entirely different locality from the copper mine proper.

The company also has a reverberatory furnace for the production of a copper matte from certain grades of sulphide ores; also a concentrating mill of crushers, rolls and eight Bartlett tables. The idea is to be prepared to treat all classes of ore and send out nothing but a metal product. The matter of putting in a lead furnace is also being considered, as there are lead ores in this locality.

Water supply is pumped from Pinal creek, 4 miles away, through a 4-inch pipe line. The company's holdings comprise 1600 acres. Work on the group was begun seven years ago; and Manager Fleming states that thus far there has been an expenditure of about $700,000; but the equipment described, including the acid plant, is now practically complete and ready to operate.

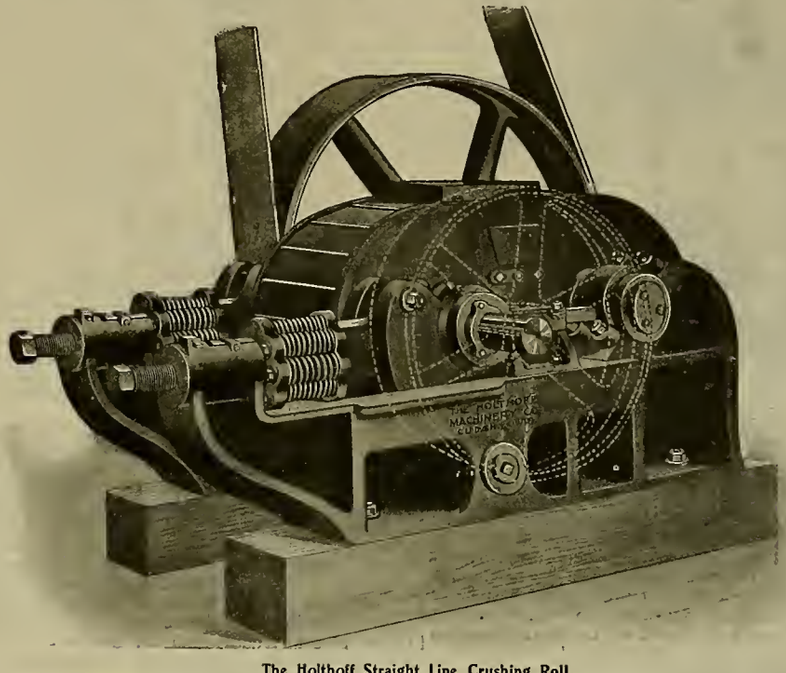
H. A. Hillman is superintendent, E. H. Benson has charge of the acid plant and J. B. Mugford the refinery.

Black Warrior, Ariz., March 1.

The Holthoff Straight Line Crushing Roll.

Among the many improvements made during the last decade in machinery used in connection with the reduction of ores, no one machine has undergone such a complete change as the crushing roll. The radical change in design and construction that is seen in the modern rolls when compared with the old style Cornish roll of twenty years ago is very marked.

This improvement applies alike to design, character of material and the workmanship entering into its construction. The old Cornish roll was constructed of cast iron throughout. It was driven by ponderous but unscientifically designed gearing.



The Holthoff Straight Line Crushing Roll.

The shells or tires, even when not cast in one piece with the hub and shaft, were made of iron uncertain in hardness and homogeneousness. Owing to faulty design and unsuitable material, these rolls could only be run at a slow speed and were only suitable for crushing comparatively soft material.

With the introduction of modern concentrating tables and the various leaching processes for the extraction of the precious metals chemically, the advantages of granulating an ore as compared with pulverizing became apparent and created a necessity for improved crushing rolls. This necessity has been gradually supplied by the manufacturers of mining and metallurgical machinery, as is evidenced by the numerous improvements in the crushing rolls that have been brought out within the last ten years.

Herewith is illustrated a late production in this line, namely, the Holthoff straight line roll, which is manufactured by the Holthoff Machinery Co. These crushing rolls are not entirely new in principle, nor are they calculated to revolutionize the construction of this type of machine generally, but they are the result of many years of experience in the operation and designing of rolls and, the manufacturers say, embody all the good features essential in a machine of this kind. In design and number of parts, they are simplified. The springs are located so that they exert pressure directly on the movable roll in a straight line without intervening tension rods, bolts, etc. The frame is made in one casting, strongly ribbed in such a form that the metal is distributed where the strains come. The adjustments are few and simple and can all be made while the rolls are in operation.

These rolls are designed for both wet and dry crushing. For further description and information address the Holthoff Machinery Co., Milwaukee, Wis.

A Trouble in Assaying.

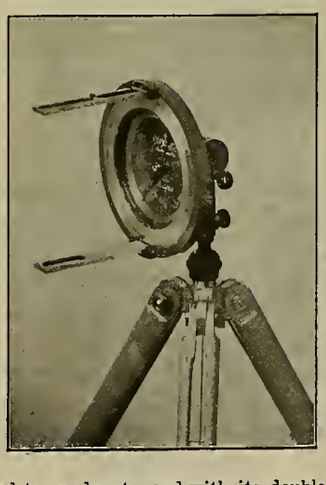
TO THE EDITOR:—I am assaying an ore here in which there is a great deal of sulphur and which makes a lead button about three times as heavy as I would like to have it. I have decreased the amount of ore for a charge until I cannot reduce it any more, as it is a low-grade silver ore. Now, nitre is not considered safe to use as a desulphurizer, and can you tell me if there is anything that I can use that is? I use nails at each charge, but as I understand it they are simply to refine the lead in a way, and keep the sulphur out of the lead button, but do not help at all in reducing size of lead button. Now, nitre not being advisable to use, and all authorities I believe agreeing on that point, what is to be done to reduce the amount of lead thrown down? I do not want to have to roast each sample in order to destroy the sulpbur, neither do I want to be obliged to cut a button up into three pieces in order to get it into cupels. If you do advise roasting each weighed sample, do you add anything to the pulp? Salt, for instance?

Try roasting at a very low temperature without adding any chemicals while roasting. If roasting is not desired and the lead button is too large to cupel, it could be scorified till it is sufficiently small to work to advantage in the cupel.

Lallie's Universal Transit Compass.

Herewith is illustrated Lallie's patent universal transit compass, in the construction of which, the manufacturer states, only such features have been adopted as will facilitate the work of reconnoisance and preliminary surveys, either on the surface or underground. Careful and painstaking attention to constructive detail are designed to earn for this little instrument the admiration of progressive engineers. Surveyors and civil and mining engineers are expected to find this instrument compact, practical, simple in design and easily manipulated. Location surveys of mining claims can be performed quickly, the engineer not being hampered with a heavy instrument.

The instrument is provided with a graduated cir-



cle figured to quadrants, and with its double vernier all horizontal and vertical angles are read to single minutes. A variation plate and levels are provided. A round extension tripod, with aluminum head and clamps, supports the instrument, and when "set up" at any point any horizontal angle can be deflected and any angle of elevation or depression can be read to single minutes, independent of the needle.

Owing to the change of topography, it is often difficult in certain localities to trace the apex of a mineral or coal vein, and to be able to definitely locate the apex or outcropping of any particular vein at a distance away from an opening already made upon the vein, without making tedious measurements and difficult calculations, is of value.

Lallie's transit compass is made of hardened

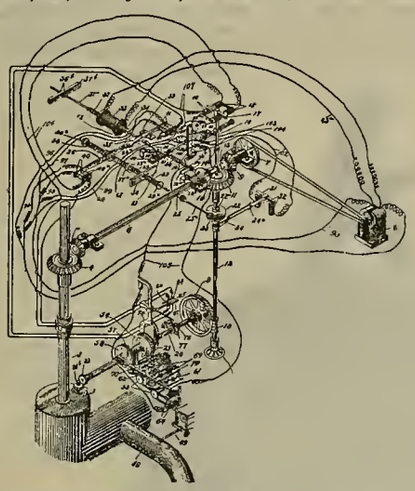
aluminum. It reads all angles independent of the needle. Tangent lines can be extended up or down hill, and vertical sighting can be done, as with a side or top telescope to a transit. Any line can be extended by back or fore sight, or deflected, as with a large transit. It weighs four pounds, complete with tripod and sole leather sling case. The Lallie Instrument Co., Denver, Colo., are the sole manufacturers and dealers.

Mining and Metallurgical Patents.

Patents Issued March 11, 1902.

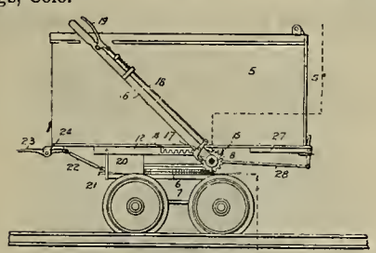
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

ELECTRO-MECHANICAL WATER WHEEL GOVERNOR.—No. 695,220; L. Lyndon, New York, N. Y.



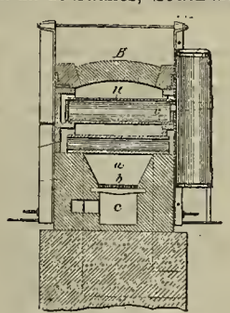
A water gate operating shaft, driving shaft and reversing clutch gear, adapted to connect shafts so as to cause water gate operating shaft to move in either direction, dynamo operatively connected to produce an electro-motive force responsive to speed of water wheel, selenoid device energized by dynamo, core for selenoid and circuit controller actuated thereby, springs for holding circuit controller in normal position, two electro-magnetic devices for reversely operating reversing clutch gear, returning device adapted, when operated, to return circuit controller to normal position, clutch adapted to bring returning device into operative connection with water gate operating shaft, magnet controlling clutch, circuit for magnet including a circuit closer operatively connected with aforesaid circuit controller and adapted to energize magnet on movement of circuit controlling in either direction.

ORE CAR.—No. 695,344; P. J. Smith, Idaho Springs, Colo.



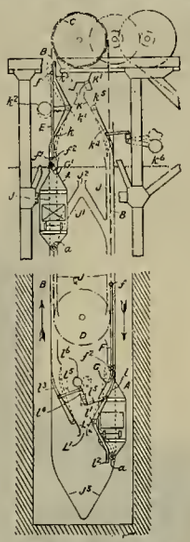
A car truck, platform and car body, car body being slidable on platform and having hinged door, shaft journaled on platform, on which car body is pivoted, connection between shaft and car body whereby latter is shifted by turning shaft, block slidable on bottom of car body, dog pivoted on block and arranged to lock car body in closed position, and a rod connecting dog with shaft whereby dog is automatically actuated as car body is shifted.

PRODUCTION OF ZINC DUST.—No. 695,376; G. G. Convers and A. R. de Saulles, South Bethlehem, Pa.



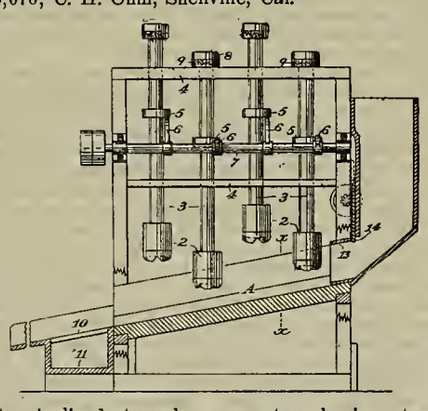
Process of obtaining maximum yield of zinc dust or blue powder from a given retort charge, while excluding injurious admixture of zinc oxide therewith, by heating charge to effect distillation of zinc, conveying off separately preliminary oxide of zinc vapors generated in retort, then receiving metallic zinc vapors given off from charge, from muffle directly into collecting chamber, thereby maintaining their temperature throughout above point of liquefaction of any substantial portion of vapor until they have entered the collecting chamber, immediately expanding and condensing them to zinc dust in chamber; and interrupting flow into collecting chamber when, at final stage of operation, oxide of zinc vapors reappear therein.

RAISING OR LOWERING APPARATUS FOR MINES OR THE LIKE.—No. 695,287; D. Davy, Sheffield, England.



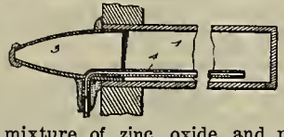
Pendulous cage carrying slings, pair of endless chains to which slings are pivoted, pairs of upper and lower pulleys upon which chains run, guides adapted to bring cages and lower ends of slings to mid-position between ascending and descending chain members at upper and lower landing points, means of temporarily supporting cages at landing points, means of detachable connection between slings and cages, means of effecting connection consisting of hooks pivoted to slings, hooks of successive slings pointing in opposite directions, adapted to be pivotally controlled by guides so as to be thereby caused to enter into engagement with or become disengaged from cages.

CEMENT GRAVEL CRUSHER AND SEPARATOR.—No. 695,076; C. H. Ohm, Shellville, Cal.



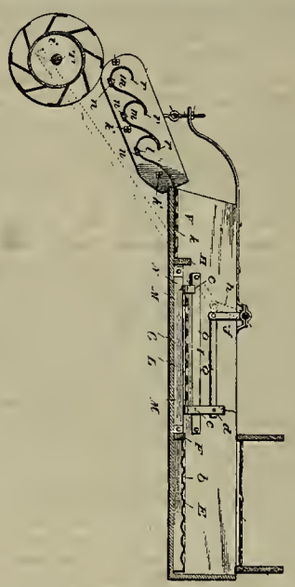
An inclined trough or mortar having transversely curved bottom, hopper, feed pipe discharging into upper end of trough and controlling gate therefrom, stamps having corrugated bottoms, vertically guided stems to which stamps are attached and mechanism by which they are raised and allowed to fall, heads carried by stamp stems and cushioned stops upon which they fall before stamps strike bottom of trough whereby cement is separated and pulverized without breaking stones, screen inclined in general direction of trough through which pulverized material falls and over which stones are discharged.

PROCESS OF SMELTING ZINC.—No. 694,947; S. Davies, Iola, Kans.



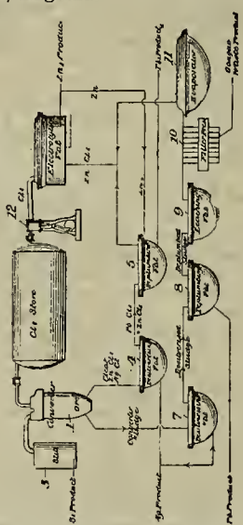
Placing mixture of zinc oxide and particles of non-metallic refractory substances within retort, exteriorly heating latter, passing current of hydrocarbon gas through charge, whereby reduction is effected, conducting gas and vaporized metal carried thereby through a condenser to deposit metallic zinc, and finally permitting gas to escape.

SLUICE BOX.—No. 695,085; L. B. Tanner, Seattle, Wash.



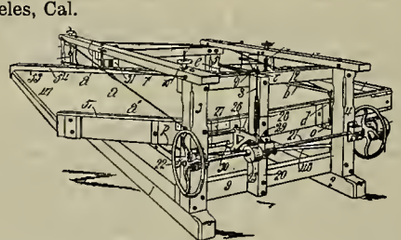
Sluice box provided at one end with raised amalgamating plate E formed with circular cups in its surface, transverse partition F forming support for one end of plate and constituting one end of chamber G which receives water and dirt from plate, gate H constituting opposite end of chamber and being higher than partition F, flume A having perforated bottom above plate E and extending transversely across sluice box.

PROCESS OF EXTRACTING METALS FROM SULPHIDE ORES.—No. 695,126; J. Swinburne and E. A. Ashcroft, London, England.



Treating sulphide ores by passing chlorine through bath of ore and a fused chloride, thereby producing free sulphur, the chlorine combining with metals of ore.

ORE CONCENTRATOR.—No. 695,064; L. Look, Los Angeles, Cal.



A frame; concentrating table which slopes longitudinally downward from head to tail and discharges over edge at tail; yoke; flexible means at middle of yoke connected with frame at one end for supporting yoke; links at ends of yoke, respectively, loosely connected with yoke and with opposite sides of table at one end thereof; two table-supporting links at other end of frame, which are respectively loosely connected with frame and with table at opposite sides; intermittent means for moving table in one direction; resilient means for returning table; means for stopping table at its return; table also sloping transversely downward from concussion side to opposite side.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

JUNEAU.

Manager C. H. Pearce of the Alaska Perseverance group of mines, in Silver Bow basin, near Juneau, is en route to San Francisco to buy machinery for use in driving a mile long tunnel recently started. Its primary object is to provide an outlet at depth for large ore bodies on the opposite sides of the mountain. The tunnel has cut through a large vein of good paying ore at 300 feet from the tunnel entrance.

The machinery for the 5-stamp mill in the Unuk river district, near Ketchikan, is being taken from that place in a scow, which will be towed 40 miles up the Unuk river, to the millsite of the Unuk River M. Co.

ARIZONA.

COCHISE COUNTY.

Hands Bros. of Galeyville have sold their mining property in the Chiricahuas to P. H. Clark of Los Angeles and associates. The ores from the group carry high percentages in lead and silver. Shipments of ore made are claimed to have paid for the development work so far.

GILA COUNTY.

J. Pascoe, owner of four copper claims at Black Warrior, is now doing development work, that is opening up a body of carbonate and chrysocola ore. A shaft is now down about 60 feet. W. H. Hender is Supt.

W. N. Bowen, vice-president of the Pinto Creek M. & S. Co., and T. Crandall, consulting engineer, have been to Del Shay basin, north of Globe, examining some property on which the company has a bond. They have made a shipment to test its values and to find out what kind of a process is best adapted for the treatment.

MARICOPA COUNTY.

The discovery of a rich body of gold ore in the Oro Grande group at Wickenburg is reported. The ledge is said to be 120 feet wide, all ore showing pay values.

The Denver Group G. & C. Co. at Wickenburg has its tunnel in nearly 450 feet. The contractors have finished over 150 feet of their last 200-foot contract. Additional contracts will be let and the development work continued until the ledge is crosscut. A. H. Gamage is manager.

The Chicago, New York & San Francisco group at Wickenburg, owned by J. W. Munchus and S. Powell, which is bonded to a London company, are in an immense quartz porphyry dike 300 feet in width, which seems to have gold, silver and copper distributed pretty evenly all through it.

A 12 H. P. gasoline hoist for the Angel mine at Wickenburg has been installed and sinking toward the 300-foot level started. It is probable that several electric drills will be used in the work.

MOHAVE COUNTY.

The tunnel on the Leland vein, in the San Francisco mining district, owned by T. Ewing, is in 500 feet and has cut a large ore body. S. Bedell is Supt.

The C. O. D. mine, near Kingman, has opened up on the 400 level a very large ore body. The ore at present being worked through the mill comes from winzes and drifts, no stoping being done. A larger and more complete plant is considered necessary.

At the Gold Road mine, under Supt. Stevens, about 100 men are employed. This, it is stated, is in anticipation of the erection of a milling plant near the property. In the shaft the water is increasing. The tunnel is showing very rich ore bodies and in the crosscut at the bottom of the shaft there is a solid body of ore 15 feet in width which, it is claimed, averages $18 a ton.

YAVAPAI COUNTY.

The stockholders' meeting of the United Verde C. Co., held in New York, received a financial report showing that the profits of the company for the year ended December 31, 1901, were $3,235,845. Out of that dividends amounting to $2,924,142 were paid, and there was carried to surplus account $313,703, which, added to the previous surplus of $935,843, makes the total surplus $1,247,186.

Mrs. A. V. Kautz of Tacoma, Wash., has sold the Gopher gold mine, near Prescott, to the McCook Extension M. Co. for a large sum. The mine has been developed by her and a number of associates, who have advanced $45,000. Mrs. Kautz, it is stated, personally superintended this work. Mrs. Kautz also owns silver property in the Bradshaw district and proposes to undertake its development this summer.

The Dutton property, on Cherry creek, near Prescott, which is equipped with a mill, is starting up, after lying idle for four years, under the control of a newly organized company, with M. Ralston as manager.

YUMA COUNTY.

The Rio Del Monte G. M. Co., which owns the group of mines near Harqua Hala, is reported to be about to commence the erection of an 80-stamp mill. Ex-United States Senator Pettigrow of South Dakota is general manager of the company.

W. E. Defty has sold the Mountain Chief mine at Harqua Hala to Eastern people. The ores mined are milled in a stamp mill situated about 3 miles from the property.

CALIFORNIA.

At a meeting of the executive committee of the California State Miners' Association in San Francisco March 19, the following resolutions were unanimously adopted:

Resolved, That we earnestly urge upon our Senators and Representatives in Congress to use their utmost efforts to secure the enactment of the so-called Mineral Lands bill now pending in Congress, to the end that there may be a prompt, effectual and final classification and segregation of the mineral lands within the railroad land grants of California, and that such mineral lands may be again thrown open to exploration and purchase as part of the public domain. No effort should be spared to secure the enactment of this legislation at this session of Congress.

Resolved, That the mining industry of this country, with its enormous output of raw material, its momentous significance to the industrial prosperity of the Nation and its vast possibilities of future development, warrants and demands the Governmental protection and aid that can be adequately extended through a Cabinet office of the Executive Department of the Government.

Resolved, further, That we heartily endorse the bill now pending in Congress for the creation of a Cabinet Department of Mines and Mining, and in behalf of the miners of California we demand the passage of said bill.

The executive committee asked the Board of Supervisors of the mining counties to appoint committees to assist the State Mining Bureau in securing ores and specimens to be placed by the Mining Bureau in California's mineral exhibit at the St. Louis Exposition which opens in April, 1903.

AMADOR COUNTY.

The Cranmer Bros., at Pine Grove, are operating a small mine with a 2-stamp mill. It is reported that they have struck a body of high-grade ore.

Supt. Hyner of the Mitchell mine, at Pine Grove, has bought a 20-stamp mill which is to be added to the present milling capacity of ten stamps. The 10-stamp mill has been crushing rock for eighteen months with satisfactory results. Improvements in the shape of additional machinery are being made.

At the Bunker Hill, near Amador, prospecting operations continue. At the 800 level fairly good ore has been uncovered in the bottom of the drift. Since the present company started work they have expended $90,000 in development work.

BUTTE COUNTY.

The Clark Old Channel mine, near Yankee Hill, is shut down as the result of a landslide from the hill above the claim, which took the mine buildings and all in its course and smashed everything to pieces.

CALAVERAS COUNTY.

The Sultana M. Co., operating the Bovee mine at Angels, is building an engine house and other buildings at the mine. Cement foundations are being laid for the 90 H. P. compressor and the electric motor for it. The shaft is to be sunk deeper.

In the Prince mine, at Altaville, the vein is 8 feet in width at a depth of 100 feet and is said to be rich.

The postoffice at Robinsons Ferry has been changed from the name of Robinsons to Melones and after April 1 will be known by the latter name.

DEL NORTE COUNTY.

J. White and M. E. Moore of Crescent City, who have a free gold prospect in Shelley Creek, eastern Del Norte county, propose to put in a stamp mill on their claims in the near future.

A. A. Davis, of Medford, Oregon, has bonded the Monumental mine at Shelley Creek from Baker & Jackson, at $60,000.

HUMBOLDT COUNTY.

The Gold Sand M. Co. has completed arrangements for working the sands in Big Lagoon, situated on the coast above Trinidad. Recent tests of the granite sand in the lagoon are reported to show that it can be worked at a profit on a large scale. The company has shipped a dredger and other machinery to the property.——Another company, Connecticut people, of which S. Whitlock of Eureka is the head, is also preparing to operate in the same district and is shipping material to the Big Lagoon from Arcata.

NEVADA COUNTY.

J. Eddie, formerly Supt. of the Pennsylvania mine, at Nevada City, is Supt. of a company to develop the Iowa mine, near Graniteville. The mine will be worked for both gravel and quartz deposits.

The Gold Bank mine, near Maybert, owned by C. Belden and others of Nevada City, is to be operated soon by a company represented by H. J. Griffin.

Dr. Puscheck of Chicago Park, who owns the Puscheck mine near You Bet, states that the mill has started crushing.

In the Federal Loan mine, in Willow valley, near Nevada City, the lessees have opened up a strong ledge of high-grade ore in the drifts off the 300-foot level.

Supt. Graham, C. L. Canfield and E. W. Spencer of San Francisco have been out to the Blue Tent gravel mine, near Nevada City, which is being reopened. The new tunnel is being driven ahead toward the channel.

The Gaston Ridge M. Co. has bought from D. Harmon four quartz claims near Graniteville and has bought from Mr. Harmon all his mines and real property in that district, deeds having been filed with the recorder recently.

PLUMAS COUNTY.

(Special Correspondence).—Snow blockade for two weeks; snow at the Diadem mine, 5 feet deep; on the high mountains, 8 to 10 feet—all fallen since Feb. 15; precipitation for February, 25.42 inches; March to date, 9.35 inches; total precipitation for season, 62.44 inches—about normal; water supply moderate; few mines here have been started up.

Meadow Valley, March 12.

C. L. Adams states that, as the agent of the Cataract G. M. & Power Co. of Minneapolis, Minn , he has bought the gravel mining claims owned by C. Giraud at Indian Bar, on the North Fork of Feather river, near Quincy. It is proposed to mine the ground by the hydraulic elevator process, and, in order to secure power, a ditch will be cut a distance of a mile or more.

SACRAMENTO COUNTY.

The Blue Ravine mine at Mormon Island has installed a power drill and is opening up new ground.

SAN DIEGO COUNTY.

(Special Correspondence). — The California King Gold Mines Co. are now building a 1000-ton cyanide plant at this place and connecting same with their mines with a 6-mile railroad. E. Gee, the new manager, has taken charge.

Picacho, March 13.

The Goldfields of California, Ltd., has been incorporated in London, capital £550,000, to take over and operate the Golden Cross group of mines at Ogilby.

It is stated by S. H. Lucas of Los Angeles that he has bought the Stonewall gold mine for a New York company, who have made the first payment. The property is one of the best known in the county, as it has produced nearly $3,000,000. It has been idle for the past twelve years.

The excavation for the 1000-ton reduction works at the Gold King mine at Picacho is about completed. The five large boilers are in place and the erection of the building is under way. M. Greenleaf, formerly section foreman on the Southern Pacific, is superintendent of construction on the railroad from the mines to the reduction works, a distance of 5 miles, and work on the line is now under way.

SHASTA COUNTY.

Work has been resumed on the Balaklala copper property in the Flat Creek district, near Kennet. Development work commenced on a large scale was suspended Feb. 1. Supt. Adams has returned and has started the work again.

A company composed of Salt Lake people has bought the Wynne placer claim of 160 acres near Horsetown, and is negotiating for other properties in the same vicinity. A powerful dredger will be installed on Clear creek and operated by electricity.

SIERRA COUNTY.

The Alaska mine at Pike City is reported to have been sold to a San Francisco company. It is stated that the new company will reopen the mine at once.

A. F. Eaton of San Jose, representing the Tabor M. Co. at Gibsonville, says that the Tabor mine tunnel, E. G. Squier Supt., is going steadily ahead. The rock is hard, but 50 or 60 feet a month is being made.

SISKIYOU COUNTY.

The Jillson mine at Hornbrook is employing ten men engaged in blocking out ore and getting ready to stope. They have enough in sight now to keep the 10-stamp mill running for seven or eight months, it is reported. The La Flesh mine in the same district is having a crushing made of about 80 or 100 tons of first-class ore.

In the Empire mine, on Empire creek, near Gottville, owned by C. Junker, Sr., of Yreka, a shoot of fine ore has been struck showing free gold.

TUOLUMNE COUNTY.

T. F. Coyle and C. Shafer have started work in the Never Sweat drift mine near Big Oak Flat.

It is reported that the Cosmopolite mine at Big Oak Flat is to start up. The intended improvements include the erection of a 30 H. P. engine and 50 H. P. boiler; also the sinking of a vertical two-compartment shaft to the depth of 300 feet.

At the Republican mine, near Jacksonville, stoping is in progress and the 10-stamp mill is crushing high-grade ore. R. Deleray is Supt.

B. Rucker of San Francisco has bonded to C. S. Shafer of Big Oak Flat the Never Sweat quartz mine, situated at Big Oak Flat, until March 6, 1903, with price fixed at $5000.

The shaft on the Platt & Gilson mine at Soulsbyville is being gleaned out preparatory to an examination with a view to purchase by a Colorado company. The mine has lain idle for twelve years.

It is stated that operations will be commenced shortly on the old Mount Brow gravel claim on Table mountain at Sonora. The claim has not been worked for twenty years. C. L. Lang owns the property.

At the Lost Fox mine at Carters the shaft is down 250 feet and drifting is in progress. A 20-stamp mill is under construction.

COLORADO.

(Special Correspondence).—The United States Red. & Refin. Co., with general offices at Colorado Springs, own and operate a large chlorination plant at Colorado City and two similar reduction plants at Florence. The management of this corporation is largely in control of C. M. MacNeil, C. L. Tutt and S. Penrose. Large additions have been made to this company's property within the last few days by the purchase of the Granite mine, at Victor, Cripple Creek district, at a price stated to be $500,000, and the purchase of the smelting plant and mineral holdings of the American Zinc-Lead Co. at Canyon City at a price reported to be $600,000. It is announced that the Granite mine will be operated vigorously and its large tonnage of blocked-out ore drawn upon. The smelting plant is to be enlarged and operated under the name of the United States Smelting Co., with main offices at Colorado Springs in connection with those of the present company. D. C. Jackling is to be manager of the Canyon City plant.

Colorado Springs, March 12.

BOULDER COUNTY.

R. S. Earhart of the Colorado Northern G. M. Co., at Sugar Loaf, reports that the company will run the southeast branch of its tunnel some 2000 feet farther, in order to intersect the Dime, Logan, Grand Republic, Yellow Pine and all the mines of Sunbeam gulch. The southwest branch of the tunnel will also be extended between 2 and 3 miles in order to cut the Livingston, Amalgam Thief, Smoky Hill and other mines south and west of Sugar Loaf mountain. Five electric drills will be added to the present equipment. The mines at the present time are hauling their ore by wagon to the cars at a cost of from 75 cents to $1.50 per ton; but, with the tunnel, will be able to save at least 50 cents per ton of this.

A stamp mill is to be erected to treat the copper ore being found in the vicinity of Lyons. C. A. Tripp and C. W. Strong, Supt. of the Croma Copper Co., are at the head of the enterprise and expect te have the mill completed by July 1.

CHAFFEE COUNTY.

J. S. Goodenough and G. Wooden of Parsons, Kans., have located several mining claims near Salida and are preparing to do prospecting work. They propose to do sinking and will secure all the necessary equipment.

CLEAR CREEK COUNTY.

The Sierra Nevada tunnel is projected, starting at Silver lake, near Yankee, and running in 8000 feet, cutting the Surprise group at a depth of over 1000 feet. Options are held on over 100 locations by the promoters. The tunnel is now in some 600 feet, with two pay veins of mineral opened up. If pending business arrangements go through, heavy machinery will be installed. It is said that electricity will be the power, the supply station being located on Fall river, using its water power.

The mill of the Idaho Springs Reduction Co. has started up under the management of Mr. Roller. The process comprises wet crushing, amalgamation and concentration by Bartlett tables.

W. W. Cannady has bought the Silver-

ine lode and tunnel site at Cascade from W. Graw and has started development. There is a shaft sunk on the property and a tunnel in 155 feet. A test of 1000 pounds of the ore milled netted $72.

The Lombard-Polaris mines at Yankee have been bought by the Con. Yankee Co., of which H. I. Seemann is manager. The mine has been developed by Dr. Ashbaugh of Central City and opened to a depth of 400 feet. With the mine was sold the Ashbaugh mill, which works the ores from that property. Mr. Seemann has been consolidating claims around his Manhattan tunnel and now controls a large group. Plans are on foot for heavy work and it is proposed to install an air compressor at the tunnel.

GILPIN COUNTY.

The 80 H. P. boiler for the new mill of the Bonanza mine, in Chase gulch, near Black Hawk, has been installed, work on the mill being well advanced. It will be a 25-stamp slow-drop.

Ore assaying over $50 per ton has been opened up 170 feet down in the shaft of the Katie and Francis mine at Eureka. The company will build an addition to their shafthouse and will put on a gasoline plant of from 10 H. P. to 12 H. P.

McCullough & Co., leasers on the East Notaway, near Central City, made a shipment of ore taken from the 420-foot level. The company has decided to install a new engine of about 75 H. P.

Timbers are being hauled to the Gould mine, at Nevadaville, which is being operated under a bond by G. H. Graham and associates of Denver. The shaft is down 800 feet. The operators propose to install a large plant and erect a large shaft building to put the shaft down a farther depth of 500 feet. W. Parenteau is Supt.

Manager J. A. Gilmour of the Stewart mine, near Wide Awake, has received from a run of 14⅛ cords 49.45 ounces gold and 13 tons of tailings, which sold for $18.80 net per ton. On account of the long haul to Black Hawk, it is thought that the company will decide to erect its own mill some time this summer.

Black Hawk people are interested in a lease and bond on the South Fork Running Lode at Gregory. At a depth of 75 feet they have opened up about 4 inches of a pay streak showing copper, iron and lead. The property is being worked with a whim, but the lessees expect to install a hoisting plant soon.

Stoping is being done at the O'Neill mine, at Central City, in the 464 and 666-foot levels. The average daily production is about twenty tons, mostly milling ore. It is the intention of the company to sink the shaft down to a depth of 1000 feet during 1902. H. C. Eastman is in charge for Canadian people.

HINSDALE COUNTY.

H. F. Wells, secretary of the Henson Creek Lead Mines Co., operating near Lake City, with Supt. Wearne, has been looking into the question of a concentrating mill which, he states, will be built this summer. A thorough sampling and test treatment of the ore is to be made for the purpose of determining the mill system to be installed.

LAKE COUNTY.

The Sedalia mine, which has been closed down during the winter, is to start up in April.

LARIMER COUNTY.

C. R. Hall, president of the Boston & Colorado Copper Co., and W. J. Smith of Denver, have been inspecting the Empire mine, 10 miles west of Fort Collins, with the view of putting up reduction works near the mine.

MINERAL COUNTY.

(Special Correspondence). — The new Humphreys concentrating mill at Creede is now running and is in charge of Raymond Whinnerah. It makes two products, a lead-silver concentrate and an iron-zinc material carrying silver. This mill was illustrated and described in the MINING AND SCIENTIFIC PRESS November 23, 1901.

Creede, March 15.

SAN JUAN COUNTY.

J. H. Robin of Silverton of the Ledge Mining Co. at that place says the company is ready to build the new concentrating mill and that the work would be started as soon as the snow disappears. The company has bought a new mill site on the railroad. The capacity of the mill will be made 200 tons a day. J. B. Warner, the manager of the company, will have charge of the construction.

IDAHO.

BOISE COUNTY.

The Idaho Last Chance G. M. Co., capital $300,000, has been incorporated at Salt Lake City, Utah, to take up a bond and lease on the Last Chance mining claims at Quartzburg. J. W. Burton is president and W. H. King secretary and treasurer.

CUSTER COUNTY.

J. Gauer and A. H. Tarbet of Salt Lake City, Utah, are preparing to work on the placers of the Snake river by the dredging method.

IDAHO COUNTY.

(Special Correspondence).—The Golden Rule Placer Mining Co. has been organized in Denver, Colo., by H. Riddell, C. L. Hathaway, E. W. Hurlbut, H. Thorpe, H. A. Hicks and others, to operate placer properties on Grouse creek. The company have options on the B. & B., John Claire, Ault & Kelley and Flint groups, which practically cover the Grouse creek placers from the head of the creek to the point where it flows into the Secesh. The gravel beds are said to be from 6 to 25 feet deep. Sixteen B. & B. samples averaged $2.11 per cubic yard. Twelve John Claire samples averaged 30 cents per yard. The idea of the management is to equip the property with modern facilities for hydraulic work. It is claimed the volume of water is ample. This ground is 12 miles west of Warren and about 70 miles from the railroad terminus at Council.

Warren, Idaho, March 4.

OWYHEE COUNTY.

E. F. Stuart of the Trade Dollar Con. M. Co. at Silver City has devised an electric powder thawer for use in the mine, which is very simple in construction and claimed to be perfectly safe in operation.

A large body of ore has been struck in the Davis mine, at DeLamar, in the tunnel at about 600 feet. It is reported that a mill will be built early in the spring.

The War Eagle tunnel is in 6400 feet. From the dip of the Chariot ledge in its surface workings, it has been estimated that the tunnel would cut the lode at a length of about 6300 feet. As the old works are full of water, no accurate survey can be made; and as the tunnel is 1000 or 1200 feet deeper than any workings on the vein, its dip is a matter of conjecture. The management has stopped driving the tunnel and has started a diamond drill to prospect the country ahead of their tunnel. The force of miners will be taken back to the 6180-foot station and drifts started on a cross vein at that point.

MONTANA.

FERGUS COUNTY.

C. Deyo and A. B. Hopkins, operators of the American group, in Bald Butte district, near Kendall, state that development work is being pushed rapidly. A large body of ore suitable for the cyanide process has been encountered.

On the Barnes-King property, near Kendall, the mill, which has been running since October 1, 1901, has treated 110 tons per day at an expense of not over 78 cents per ton for mining and milling. The Kendall mine people say they expect to reduce this expense before the year is over.

GRANITE COUNTY.

D. Lewis of Butte has bonded a mine in Garnet district and will proceed to develop it at once. The bond is for $10,000 and runs for a year.

MADISON COUNTY.

H. S. Gilbert has discovered a ledge of chalcedony or onyx on the divide near California gulch, Virginia City, and intends developing it this spring.

C. E. Damours of Summit is preparing to engage in extensive mining operations at the head of Alder gulch this summer. He is negotiating to buy the Eagle Hill M. Co.'s properties at Summit. Besides the erection of a mill, he will engage in placer mining.

MISSOULA COUNTY.

T. S. Letterman has bought for his company the Little Morgan lode, near Plains, and proposes to start opening it up at once. The character of the ore is a free-milling gold-bearing quartz. The company have decided to install a 10-stamp mill and plans are now ready for it. T. S. Letterman of Missoula is manager of the company.

SILVER BOW COUNTY.

The Nipper Con. Copper Co., organized in New York, has filed articles of incorporation at Helena; capital $3,750,000. The directors are S. Gifford, A. P. Heinze and R. S. Harvey, all of New York.

The 1901 report of the Butte M. & Dev. Co., operating at Butte, shows: Total cash received, $130,794; total disbursements, account Emma mine, $61,282; disbursements on the West Olive branch, $16,511; miscellaneous, $36,548; cash on hand Jan. 1, 1902, $16,452. President Lee Mantle says nothing but actual development can justify positive statements, and the present development in the Emma, while in many respects encouraging, do not warrant positive statements. The enterprise is still in a speculative condition, and it will, in my opinion, require a depth of at least 800 feet, and probably 1000 feet, to fully and satisfactorily demonstrate its value as a copper mine.

NEVADA.

HUMBOLDT COUNTY.

A large air compressor has been installed at the Imperial mine, at Kennedy, which Wynn & Lasher are operating.

The Tonopah & Golconda S., M. & R. Co. has been incorporated in Salt Lake City, Utah, to build and operate a smelter at either Battle Mountain or Golconda, to reduce the lead-silver ores of those camps and the siliceous ores of Tonopah.

LINCOLN COUNTY.

About 12 miles west of Sandy, in the vicinity of Horse Springs, N. Kuntz and C. Garrett have made a discovery of a strange ledge, one side of which carries gold and the other side gem turquoise.

A. G. Campbell of Sandy is the owner of twenty-four patented claims, besides a number of unpatented claims. A portion of this ground was recently under bond for $225,000. It is reported that Mr. Campbell is planning the erection of a smelter at Goodsprings.

NYE COUNTY.

At Ray, the new district 10 miles north of Tonopah, three important finds along the lead have been made. The company shaft now has in the bottom a good sized ledge of ore that will pay to ship. On Lease 8 a pocket of coarse gold in quartz has been found. Miller & Congdon on Lease 14 have uncovered a shoot of ore 16 inches wide that will average $400 per ton.

The prospectors in old Long Valley mining district, which is attracting attention, recently held a meeting and organized a new mining district, calling it Viola mining district, and elected S. Allen district mining recorder. The district is 15 miles square, extending 7½ miles in each direction from the Viola claim. The Viola claim, owned by J. Kiernan and S. Allen, has its shaft now down 125 feet. The ore in the shaft is from 12 to 14 inches in thickness, and is of a dark green and blue color, the average assay returns showing 115 ounces in silver and 18% copper.

WASHOE COUNTY.

The Pacific Con. M. Co. of New York has bought the J. & K. and six other mines in the Pyramid Lake district, near Reno. R. M. Parry is Supt.

The Boston mine, near Reno, owned by J. W. Carroll and C. E. Mickell, has been bonded by Miller & Price of Denver, Colo. Three extensions to the Boston, owned by Palmer, Carroll, Folsom and Mickell, are included. The price is said to be $10,000, payable in installments running throughout a year.

WHITE PINE COUNTY.

At the Joanna mine at Cherry creek, owned by J. Farren of Salt Lake City, a strike is reported of very high-grade gold ore.

NEW MEXICO.

BERNALILLO COUNTY.

The Home M. & M. Co. has been organized at Bland, in the Cochiti district, and will erect a 10-stamp mill. V. V. Clark is manager.

TAOS COUNTY.

The La Grande G. M. Co., incorporated in South Dakota, is owned by Bloomsburg, Pa., people, with its principal office in that town. The company proposes to do placer mining on its claims bordering on the Rio Grande river and in the bed of the river itself. C. B. Robbins is the secretary and treasurer of the company.

OREGON.

JACKSON COUNTY.

W. H. Maultby and A. Gilson, who are working some new placer mines at Sterlingville, think they have struck the old boulder pay channel. They have run a drift 180 feet long and found good pay dirt. The gold is coarse, some of the pieces weighing as high as $4 and $5 each.

JOSEPHINE COUNTY.

F. D. Russell, secretary of the Oregon Con. M. Co., operating near Glendale, says his company is prospecting a piece of placer ground, working with one giant, and is building a 4-mile flume to bring more water to the property from Rift creek.

I. Coffman recently took out twenty ounces of gold from a pocket on Dumpy gulch, in the Forest Creek district, near Grants Pass.

A ledge of free milling quartz running $10 to the ton has been struck in the Sunset mine, near Grants Pass.

Two engines, a small sawmill, large cables and other machinery have arrived at the Golden Drift mine in Dry Diggings district, near Grants Pass. A dam will be built across Rogue river and six water wheels installed to furnish 3000 H. P. A battery of pumps will furnish water for six giants and an irrigating ditch.

A new cyanide plant has been recently installed at the Gold Bug mine in the Mount Reuben district, near Grants Pass, and the tailings of the mill, the savings of several years of its operation, are being worked over, yielding an average of $15 per ton.

The Oviatt hydraulic mines on Pickett creek, near Grants Pass, have been bonded to San Francisco people for sixty days by G. W. Trefern at $35,000.

SOUTH DAKOTA.

PENNINGTON COUNTY.

The plant built at Deadwood for the Imperial Co. has been finished and the machinery was started and tested. The plant is a 200-ton cyanide with all the late improvements. The boilers that have been installed will handle 250 tons a day, but only tanks to handle 200 tons a day are in it at present.

UTAH.

BOX ELDER COUNTY.

The Hot Springs M. Co. of Ogden has been incorporated, capital $50,000, with T. W. Jackson president and G. Gould secretary and treasurer. The company owns four mining claims in Park valley.

IRON COUNTY.

The mines and mills of Stateline are to be provided with a pipe line supply of water and contracts for 16 miles of pipe will be let, as soon as the business details are arranged. H. Rives, who owns the springs in Hamlin valley, will build the pipe line.

The Venus G. M. Co. has been incorporated in Salt Lake City, capital $500,000, with J. F. Hittle president and C. T. Candish secretary and treasurer. The company owns the Goodwin, Pioneer and Volunteer lode mining claims at Stateline.

SALT LAKE COUNTY.

The directors of the Silver Shield M. Co. have approved a contract with the United States M. Co. for the use of the old Franklin tunnel by the Silver Shield Co. at Bingham and will resume operations at once. H. Joseph has been elected manager.

When the United States smelter at Bingham Junction starts up in August the recently constructed smelters will handle about 3300 tons of ore daily. The minimum tonnage will probably be: A. S. & R. Co. 1000 tons, United States 1000 tons, Bingham Con. 600 tons, and Highland Boy between 500 and 600 tons. Of the total, Bingham should be producing nearly 2000 tons daily.

To perfect the mechanical equipment at its milling plants, the Bingham Con. Co. has decided to provide the Dalton & Lark group of mines at Bingham with a concentrator, and experiments are now being made by J. D. Flemming, the company's experienced metallurgist, to determine the desirable construction.

SUMMIT COUNTY.

The Little Bell Con. M. Co. of Wyoming has been incorporated, to buy and operate the Little Bell and several adjoining claims in Uintah mining district. The trustees are J. H. Kirk, H. Bamberger and A. A. Rudy of Salt Lake City.

WASHINGTON.

FERRY COUNTY.

Supt. W. M. Crummer of the Gold Ledge mine at Republic states that work on the tunnel will be resumed in a short time with a diamond drill to explore ahead for ore.

OKANOGAN COUNTY.

A Spokane company is planning to construct an aerial gravity tramway from the Big Bend plateau to a point near Entiat, on the Columbia river, to open up the Waterville section of the Big Bend country. The incorporators are E. D. Olmstead, G. F. Crane, G. F. McKinney and C. G. Betts, all of Spokane. The road will be run on the two cable system by gravity.

Fire at the Mineral Hill mine, near Conconnully, destroyed $15,000 worth of new machinery lately installed, and $5000 worth of new mine buildings. The Mineral Hill mine is owned by Dr. J. May of Bridgeport, Conn., and associates. The engine house, two shaft houses, tool shed, blacksmith shop were destroyed, but the boarding house was saved. There was no insurance. The company will resume operations as soon as new machinery can be brought in.

FOREIGN.

BRITISH COLUMBIA.

The Mines Exchange, Ltd., of Nelson says: The Farrel Bros., owners of the Society Girl mine in East Kootenay, have been working their property all winter, and will increase the force with the opening of spring.

Development work is being done on the Estella mine. Over 2000 feet of tunnels, shafts and adits have been run, and a large amount of ore has been blocked out. It is the intention of the owners to erect a concentrating plant at the mine. The ore will concentrate 3 to 1.

The Silver King group on McDonald creek, producing silver-lead ore, was recently bought by T. Starbird, represent-

ing an American syndicate. The property is a producer of very rich silver-lead ore.

The shipments of ore from Slocan City for January and February are as follows: Arlington 670 tons, Enterprise 80 tons, Ottawa 7 tons, Neopawa 20 tons, May 5 tons; total 782 tons.

The B. C. Coal Co. will undertake an extensive schemo of coal mine development on the North Fork of Kettle river, in Yale district. Diamond drills will be used, and it is intended to sink at various points to a depth of 400 or 500 feet. Two veins 3 feet and 6 feot, respectively, outcrop and can bo traced for miles. The coal is bituminous, containing 70% fixed carbon.

Nelson, March 8.

From the Slocan it is reported that a strike has been made on the Ruth mine of a body of ore that runs about 200 ounces in silver to the ton. Reports add that there are 500 sacks of this ore ready for shipment.

The White Moose group of mineral claims on Taku Arm, near Atlin, is reported bonded by J. Caplice at $105,000, and work is expected to begin immediately. Caplice has the erection of a smelter under consideration.

The manager of the Le Roi No. 2 mine, at Rossland, reports tbat in the Josie mine, 700-foot level crosscut, the vein on the hanging wall side gives assay of $25 per ton. Heretofore the principal ore bodies in the camp have been located on the east side of the dyke crossing the Josie ground. The strike in the Annie ground indicates that values prevailing on the east continue west of the dike mentioned, therefore the ore bodies are much greater than had been supposed up to the present time.

Personal.

HENRY BUTTERS has left San Francisco for London.

CAPT. J. R. DE LAMAR goes from Los Angeles to Redding, Cal.

WM. ARMSTRONG is now superintendent Mulatos mine, Mexico.

J. H. DURST of Plymouth, Cal., has returned there from San Francisco.

J. WING has resigned as Supt. Gray-Wing drift mine, near Folsom, Cal.

J. W. ABBOTT, of Lake City, Colo , has left California for Phœnix, Arizona.

F. MOREHOUSE has been appointed manager Beaver C. & G. M. Co., Milford, Utah.

GEORGE E. LANE, Supt. Horn Silver tunnel, at Frisco, Utah, is at Duluth, Mich.

W. R. SHILLING, Supt. American Girl mine, San Diego county, Cal., is in Los Angeles, Cal.

J. WILDS, late Supt. Mountain Maid mine, near Colfax, Cal., is sojourning at Amador, Cal.

C. H. PEACE, manager Alaska Perseverance mine, at Juneau, Alaska, is in San Francisco.

J. B. LIPPINCOTT of the United States Geological Survey is sojourning in San Francisco, Cal.

T. H. SELBY succeeds J. D. Burgess as manager Calabasas Copper Co., near Tucson, Arizona.

S. F. OWENS of Los Angeles, Cal., was lately in Siskiyou county, Cal., examining a mining proposition.

T. B. LUDLUM, formerly of Dutch Flat, Cal., is in charge of the Keystone placer mine at Telluride, Colo.

S. E. BRETHERTON, of Denver, Colo., is now consulting engineer Val Verde smelter, near Prescott, Arizona.

BERNARD MACDONALD, general manager Le Roi No. 2 mine, Rossland, B. C., has returned from London thereto.

H. L. COWLES of New York, general manager Pacific Con. Co., Reno, Nev., has returned from the mines to New York.

R. ALLISON, manager Puyallup mine, at Hollis, Prince of Wales Island, Alaska, has returned from a trip to New York.

C. E. PRINDLE, Supt. Mokelumne & Campo Seco Canal & M. Co., Calaveras Co., Cal., has returned from San Francisco.

JAMES H. HENLEY, formerly Supt. of the Ibex mine, Leadville, Colo., is now Supt. of the Elkton mine, Cripple Creek, Colo.

W. POLLARD has resigned as foreman South Eureka mine, at Sutter Creek, Cal., to accept a position at Coolgardie, West Australia.

W. H. MERCER, Supt. Mercer tunnel, Globe, Ariz., has gone to Gaffney, S. C., and other Eastern points, to be absent a month.

JOHN F. SUGRUE AND ARTHUR WILSON, two members of the committee selected by the miners at Dawson to protest against the Treadgold concession in the Klondike, have arrived at Ottawa, Canada.

A. S. ADDITON has returned to California from New Mexico and will open an office with the Pacific Tank Co., San Francisco.

A. J. GOODWELL, of Pueblo, Colo., has been offered the managership of the Standard Pyritic Smelting Co., Boundary Falls, B. C.

LEO VON ROSENBERG has gone to Arizona to examine some gold properties in the vicinity of Prescott. He goes thence to New York.

DEW R. OLIVER, president Zubiate M. Co., La Colorada, Sonora, Mexico, is in San Francisco to attend the company's annual meeting.

A. H. GRACEY, managing director Imperial Development Syndicate of B. C., is in California, and will visit Nevada county mines next week.

J. H. PRATT, professor of geology and mineralogy in the University of North Carolina, has been examining mines in Washoe county, Nev.

E. A. CARTER, president, and W. B. Thompson, financial agent of the Shannon Copper Co. of Boston, Mass., are at the mines at Clifton, Ariz.

W. H. LEFFINGWELL, formerly at Cripple Creek, Colo., has charge of railroad engineering in the Southwest, with headquarters at El Paso, Texas.

G. L. HEDGES has resigned as general manager of the Wauconda mine at Wauconda, Wash., on account of ill health. J. B. Rossman is temporarily in charge.

C. SULLIVAN AND W. FUSHER, of Grass Valley, Cal., have been appointed respectively superintendent and foreman of the Gold Hill M. Co., at Boise, Idaho.

F. SAXTON of Bodie, Cal., has been summoned by cable to resume the duties of his former position with the Transvaal M. Co., which employed him before the war.

S. W. TRAYLOR of the Colorado Iron Works Co., Denver, Colo., who recently made a trip to central Nevada, returned on the 17th inst. to that company's New York office.

W. H. GILLARD, late foreman and chemist in charge of the Quartette M. Co.'s plant at Quartette, Nev., is sojourning in San Francisco, Cal., en route to Seattle, Wash.

EMIL SARLIN, M. E., of the Russian Geological Survey of Finland, was in Telluride, Colo., last week, examining American mines and mining methods in the interest of his government.

R. W. MACFARLAND, a mining engineer, with a party of four miners from Ymir, B. C., will sail from Vancouver, B. C., on the 24th inst. for Singapore, Straits Settlement, whence they go north into Siam to prospect little known gold fields in that country.

J. G. HOPPER AND D. A. JONES, civil engineers of Sonora, Cal., will do the surveying of the boundaries of Yosemite National Park—a line of 300 miles. The new survey to be made provides for blazing trees all along the boundary lines and also the placing of copper sign plates at short distances apart.

Commercial Paragraphs.

H. R. AYRES, 342 So. State St., is manager of the Salt Lake City, Utah, branch office Colorado Iron Works Co., Denver, Colo.

THE Stillwell-Bierce & Smith-Vaile Co. of Dayton, Ohio, has an order for a 1000 H. P. outfit of turbine water wheels to be installed in an electrical plant at Santos, Brazil.

THE Paraffine Paint Co. of San Francisco was incorporated this week with a capital of $300,000. Its directors are Robert S. Moore, James S. Manley, Charles E. Green, Richard S. Shainwald and Alexander F. Morrison. The par value of the capital stock is $20 per share.

THE Krogh Manufacturing Co. has established a salesroom and office at 519 Market street, San Francisco. The premises run through to Stevenson street, with a rear entrance opposite the works, Nos. 9 to 17. The Krogh Manufacturing Co. is doing a large business in mining machinery and pumping plants.

JEAN F. WEBB, Denver, Colo., owner and patentee pneumatic cyanide process, has sold a half interest therein to the Colorado Iron Works Co. of Denver, Colo. To handle and exploit this process a new company will be organized, capital stock $500,000. John W. Nesmith, president Colorado Iron Works Co., will be president, and Jean F. Webb, Jr., secretary. It is announced that the new company will erect plants to operate with this process, giving a special guarantee.

A. LESCHEN & SONS ROPE CO., of St. Louis, Mo., write that the contract for the machinery of an aerial wire rope tramway connecting the Ferris-Haggerty group of mines with the Boston-Wyoming smelter at Grand Encampment, Wyo., has been let to them. The tramway to be installed is the Leschen Co.'s patent, which operates automatically in receiving and discharging. They say this will be the longest aerial tramway in the world. Its length is stated to be 16 miles. There are several tramways of the Leschen Co.'s patent automatic type now in successful operation.

THE George A. Treadwell M. Co., for their Iron Queen mine bave secured a site at Mayer, Ariz., and are preparing to push the construction of a 100-ton oil smelter as fast as possible. Part of the contracts have already been made and the excavation work will be started this week. This oil smelter is along new lines and is expected to radically affect smelter practice. The installation is the largest and most extensive that has been made in that section for some time. The Treadwell Co. will be in the market for supplies extensively, for several miles of pipe, iron, wooden tankage, etc.

THE McKim gasket, manufactured by McCord & Co., Chicago and New York, is an article which seems to combine all the necessary requisites of a good gasket. The gasket is constructed of a special packing encased in soft rolled metal. The ordinary materials used are rubber compound and copper, but the gasket is also made of copper and asbestos, aluminum and asbestos, or any kind of metal or packing which is best for the particular purpose for which the gasket is wanted. It is guaranteed to stand 450 pounds steam pressure and has been tested to 1100 pounds hydraulic pressure. One advantage of the gasket claimed by the manufacturers is that it can be reapplied a great many times, which makes it valuable for manhole and handhole plates for boilers. McCord & Co.'s catalogue, which will be sent on application, has many pages of flattering testimonials.

THE seventh annual convention of the National Association of Manufacturers will be held in Indianapolis, Indiana, April 15th, 16th and 17th. Local arrangements for the convention are being made by a committee of Indianapolis business men under the leadership of D. M. Parry, who has been for many years a member of the executive committee of the Association, and a hospitable welcome to visitors is assured. Members of the Association are manifesting more than usual interest in this year's convention and there is promise of a large attendance from all parts of the country. The National Association of Manufacturers was organized in Cincinnati in 1895, and its annual conventions have been held in Chicago, Philadelphia, New York, Cincinnati, Boston and Detroit.

Latest Market Reports.

SAN FRANCISCO, March 21, 1902.

METALS.

SILVER.—Per oz., Troy: London, 24⅛d (standard ounce, 925 fine); New York, bar silver. 53⅞c, refined (1000 fine); San Francisco, 53⅞c; Mexican dollars, 44½c San Francisco, 43½c New York.

COPPER.—New York: Lake, 1 to 3 casks, $12.50; carload lots, $12.25; Electrolytic, 1 to 3 casks, $12.25; carload lots, $12.50; Casting, 1 to 3 casks, $12.00; carload lots, $12 25. San Francisco: $14.00. Mill copper plates, $17.00; bars, 18@24c. London: £54 per ton.

On the 1st inst. there were 18,948 tons copper in France and England and 6080 tons on the way there. Copper imports into England for the first sixty days of the year totaled 38,605 tons. Liverpool and South Wales imported 11,627 tons copper from the United States in January and February, 1902.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £11 10s per ton.

SPELTER. — New York, $4.35; St. Louis, $4.00; London, £17 12s per ton; San Francisco, ton lots, 5¼c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, $26.50; San Francisco, ton lots, 27c; 1000 lbs., 27½c; 500 lbs., 27¾c; 200 lbs., 27½c; less, 28c; bar tin, ℔ lb, 30c.

PLATINUM.—San Francisco, crude, $17 ℔ oz.; New York, $18 per Troy oz.

QUICKSILVER.—New York, $51.00 large lots; London, £8 15s; San Francisco, local, $47.50 ℔ flask of 76½ lbs.; Export, $45.00

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER.—Half-and-half, 100-lb. lots, 18c; San Francisco, Plumbers', 100-lb. lots, 14.20c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $16.75; gray forge, $17.50; San Francisco, bar, 2.75 ℔ lb .,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $31.50; open hearth billets, $32.00; San Francisco, bar, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per bbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3 70; 4d and 5d, Wire, $3.80; Cut, $3 80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No. 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $8.50; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk; $17 in sacks.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 30@31c ℔ lb.; carloads, 28@29c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2½@3o ℔ lb.; blue vitriol, 5½@6½c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 6c; alum, $1.90@2.00; flour sulphur, French, 2½@ 2½c; California refined, 1½@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls. 8c: caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 76c; cs., 81c; raw, bbl., 74c; cs., 79c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 66c; cs, 71c; raw, bbl., 64c; cs, 69c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13½c; Mineral Seal, iron bbls, 19c; wooden bbls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 15c; do., cs., 21½c; 86° Gasoline, bulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 20½c; Lard Oil, No. 1 bbl., 60c: cs., 65c; Neatsfoot Oil, bbl., 67½c; cs., 72½c; No. 1 bbl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¾c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., per lb., 7½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¾c; do. in kegs, 7¼c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c.

WHOLESALE.

ASSAY LITHARGE.—Per lb , 10c.

BISMUTH.—Subnitrate, per lb., $1.60.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2¼ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., .07c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco.)

Recently Declared Mining Dividends.

	Payable.
Centennial Eureka M. Co., Utah, quarterly, 50 cents per share, $50,000	April 1
Gwin Mine Dev. Co., Cal., No. 31, 20 cents per share, $20,000	March 18
New Idria Q. M. Co., Cal., quarterly, 10 cents per share, 10 cents extra	April 1
Napa Q. Co., Cal., quarterly, 10 cents per share	April 1
Gold Coin M. & L. Co., Colo., monthly, 3 cents per share, $30,000	March 25
Consolidated Mines Co., Colo., monthly, 1 cent per share, $19,000	March 25
New Zealand Con. M. Co., Colo., monthly, 1 cent per share, $9000	March 25
Empire State-Idaho M. & Dev. Co., Idaho, monthly, 5 cents per share, $25,277	March 15

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING MARCH 11, 1902.

695 263.—SASH FASTENER—W. R. Abrams, Portland, Or.
695,135.—SAW SET—Baggs & Cummin, San Jose, Cal.
695,136.—WATER HEATER—M. A. Baker, Stockton, Cal.
695,269.—SEWING MACHINE—F. O. Berg, Spokane, Wash
694,939.—CAISSON—C. Blagburn, S. F.
695,034.—BOILER CLEANER—J. H. Connolly, Clifton, Ariz
695,096.—BROILER—J. P. Falvre, S. F.
695,382.—HEATING ORCHARDS—C. Froude, Riverside, Cal.
695,383.—MAGNETIC TRACTION—S. A. Gibbs, Tacoma, Wash.
695,206.—ELECTRIC REHEATER—G. Grieschc, Berkeley, Cal.
695,047.—NUT WRENCH—W. F. Hamilton, Ventura, Cal.
695,306.—LAMP HANGER—H. J. Harrison, Juneau, Alaska.
694,971.—RECTAL INSTRUMENT—S. L. Kistler, Los Angeles, Cal.
695,157.—BRONZING MACHINE—G. Klaiber, Los Angeles, Cal.
695,063.—MOP BEAD—J. C. Look, Tudor, Cal.
695,064.—CONCENTRATGR—L. Look, Los Angeles, Cal.
695 162.—CARPET CLEANER—A. Lotz, S. F.
695,329.—CHUTE—W. L MCCABE, Tacoma, Wash.
695,167.—MEASURE STERILIZER—J. C. F. McGriff, S. F.
695,169.—CASING SPEAR—E. Nortb, Los Angeles, Cal.
695.076.—GRAVEL CRUSHER—C. H. Obm, Shellvil e, Cal.
694,984.—NEEDLE THREADER—A Olson, San Diego, Cal
695,343.—ROUTING MACHINE—W. S. Richsrds, Albany, Or.
695.416.—RGLL PAPER PRINTING—B. Ring, S. F.
695,085.—SLUICE BOX—L. B. Tanner, Seattle, Wash.
35,506.—DESIGN—Stetson & Thomas, S. F.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

BROILER.—No. 695,096. March 11, 1902. J. P. Falvre, San Francisco, Cal. This invention relates to improvements in hrolling devices. It includes two grid members hinged at one side having the hinges so disposed that these members may be separated to a greater or less distance as they are folded upon themselves, to handle support in which members are turnable and a latch within the handle extending lengthwise and elidable eidewise, so that its inner end engagee and locks the parts together to allow articles of any varying thickness to be held within the broiler.

ELECTRIC STEAM RE-HEATER.—No. 695,206. March 11, 1902. G. Grieschc, Berkeley, Cal. This invention relates to a means for superheating eteam after it has been deflected. It consists in the application of electrical resistance plates. and means for suspending them within tbe space included in the walls of the engine casing. Wires lead from the plates outwardly through tbe engine casing to a source of electric energy whereby the resistance plates may be heated. and the steam passing over them dried and super-heated.

LIQUID MEASURE AND STERILIZER.—No 695,167. March 11, 1902. J. C. F. McGriff, San Jose, Cal. This invention is designed for the purpose of measuring and sterllizing liquids at a single operation. It consists of compartments formed in a single structure whereby different quantities of liquid may be measured in tbe different compartments, and discharge passages so that the liquid from either compartment may he p ured through a common discharge, and in conjunctlon with this a means for sterilizing the milk or other liquid by forming the double walls of the compartment so that boiling water may be introduced into the spaces surrounding the milk-containing compartments.

Annual Meeting.

The Regular Annual Meeting of the Stockholders of the SPANISH CONS. QUARTZ MINING COMPANY will be held at the office of the Company, 113-114 Crocker Building, San Francisco, California, on TUESDAY, the 6th day of April, 1902, at the hour of 3 o'clock P. M., for the purpose of electing a Board of Directors to serve for the ensuing year, and the transaction of such other business as may come before the Meeting.

Transfer Books will close on SATURDAY, March 29, 1902, at 12 o'clock noon.

B. N. SHOECRAFT, Secretary.

Office—113-114 Crocker Building, San Francisco, California.

SITUATIONS WANTED.

A YOUNG MINING ENGINEER desires position with reliable mining or milling company as assayer, chemist, or surveyor and engineer Technical graduate; practical miner before graduation, mill and smelter work since; cyanide preferred. Can handle men. Prepared to develop small properties Good references. Address "A," Look Box 772, Florence, Colorado.

YOUNG MAN 22 YEARS OLD, JUST COMpleted four years' University course in mathematics, wants situation as helper in surveying party in the field, to earn money to take a course in mining engineering. Best references. Address "Willing to Work," care of this office.

WANTED.—Position as Superintendent or Foreman of an amalgamation and concentration mill. Have had eighteen years' experience. At present time engaged as foreman with one of the largest companies in Colorado. Best of references furnished. Address "Millman," care of this office.

AN ALL-ROUND PRACTICAL MINER, TIMberman and Tool Sharpener wants position as Foreman; also good Surveyor. Twenty-two years' experience. Successful in handling men. Regular habits. Can earn my pay. Address L. A. P., this office.

MINING ENGINEER, practical miner and mill man, assayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best references. Now working in southern California. Address A. M. P., care of Mining and Scientific Press.

WANTED.—Position as superintendent of quartz mine. Worked as miner, engineer, mill man and superintendent. Superintendent at present Would engage for foreign service. References given. Address Economy, this office.

WANTED.—POSITION AS MILL SUPERINtendent or Foreman. Understand concentration, amalgamation, cyaniding and assaying. Seventeen years' experience. Address "Mill Foreman," care of Mining and Scientific Press.

WANTED.—POSITION AS ASSAYER, SURveyor, or Assistant Superintendent by technical graduate; three years' experience in mines of California and Colorado. Address I. E. D., care of Mining and Scientific Press office.

WANTED.—SITUATION AFTER MARCH 15, 1902, as Manager or Superintendent of mine. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work. Four years' experience as manager and superintendent. Treatment of low grade ores a specialty. Practical in every detail. State location of mine and salary Best of references. Address X. Y. Z., this office.

OPEN FOR ENGAGEMENT, A MINING AND Metallurgical Engineer. Eleven years' experience as Consulting Engineer and Manager. Graduated from the best technical schools in Europe Specialty: examination and management of gold and silver properties. Location must be in California, Arizona or Nevada. Salary $5000 per year. Address C. A., care Mining and Scientific Press.

Annual Meeting.

The Regular Annual Meeting of the Stockholders of the CONS. ST. GOTHARD GOLD MINING COMPANY will he held at the office of the Company, 113-114 Crocker Building, San Francisco, California, on WEDNESDAY, the 9th day of April, 1902, at the hour of 2 o'clock P. M., for the purpose of electing a Board of Directors to serve for the ensuing year, and the transaction of such other business as may come before the Meeting.

Transfer Books will close on SATURDAY, March 29, 1902, at 12 o'clock noon.

B. N. SHOECRAFT, Secretary.

Office—113-114 Crocker Building, San Francisco, California.

Annual Meeting.

The Regular Annual Meeting of the Stockholders of the CHAMPION MINING COMPANY will be held at the office of the Company, 113-114 Crocker Building, San Francisco, California, on TUESDAY, the 6th day of April, 1902, at the hour of 2 o'clock P. M., for the purpose of electing a Board of Directors to serve for the ensuing year, and the transaction of such other business as may come before the Meeting.

Transfer Books will close on SATURDAY, March 29, 1902, at 12 o'clock noon.

B. N. SHOECRAFT, Secretary

Office—113-114 Crocker Building, San Francisco, California.

DELINQUENT SALE NOTICE.

CONSOLIDATED ST. GOTHARD GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Nevada County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 20) levied on the 1st day of February, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
Block, Samuel	350	500	$25 00
Bauer, Teresa	518	200	10 00
Koch, C. A	116	100	5 00
Koch, G. A	138	11	55
Koch, August	139	11	55
Koch, August	329	100	5 00
Raahe, Geo. A	354	200	10 00

And in accordance with law, and an order of the Board of Directors, made on the 1st day of February, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, Rooms 113 and 114, Crocker Building, San Francisco, California, on MONDAY, the 24th day of March, 1902, at the hour of 2 o'clock P. M. of said day, to pay delinquent assessment thereon, together with cost of advertising and expense of sale.

B. N. SHOECRAFT, Secretary.

Office—Rooms 113 and 114, Crocker Building, San Francisco California.

DEWEY, STRONG & CO.,

Patent Agents, S. F.,, Cal., and Washington, D. C.

WANTED.

CAPITAL WANTED.—I am in a position to secure a valuable quartz proposition (gold). Can get a good working bond on esme. Will give best of reference as to character and ability. W. B. GRANT, Tuttletown, Tuolumne Co., Cal.

WANTED.—Five or Ten Stamp Mill in Good Condition.

LANDERS' SONS, 275 Madison St., CHICAGO.

STAMP MILL WANTED,

either ten or twenty stamps, second band, as near Amador County, California, as possible. Must be in good condition, and low as to price—advertiser has himself built mills and then tried to sell. so don't quote fancy figures Water-power mill preferred; steam no objection, however. Give full details, price, location, condition. Concentrators acceptable if with plant. Will also buy small boiler and any good second band mine equipment. Address E. N. DARLING, 9 Pine St., New York.

ASSESSMENT NOTICES.

TANANA MINING COMPANY.—Location of principal place of business, San Francisco, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 4th day of March, 1902, an assessment (No. 5) of ten cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Room 405 Claus Spreckels Building, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 7th day of April, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on TUESDAY, the 29th day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

EDWARD H. STEARNS, Secretary.

Office—405 Claus Spreckels Building, San Francisco, California.

LARKIN MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, El Dorado County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 5th day of March, 1902, an assessment (No. 12) of two (2) cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, 112 Main street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 12th day of April, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 5th day of May, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

N. F. REMINGTON, Secretary.

Office—112 Main street, San Francisco, California.

MARINA MARICANO GOLD MINING COMpany.—Location of principal place of business, San Francisco, California; location of works, Sunny Hill, Shasta County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 8th day of March, 1902, an assessment (No. 29) of three (3) cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, 217 Sacramento street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 19th day April, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 12th day of May, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

CHAS. BOYSEN, Secretary.

Office—217 Sacramento street, San Francisco, California

LITTLE STANDARD OIL COMPANY.—Location of principal place of business San Francisco, California; location of works, McKittrick District, Kern County, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 4th day of March, 1902, an assessment (No. 3) of ten cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Room 40, Chronicle Building, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 12th day of April, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 12th day of May, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors

R. L. CHENEY, Secretary.

Office—Room 40, Chronicle Building, San Francisco, California.

EUREKA CONSOLIDATED DRIFT MINING COMpany.—Location of principal place of business, San Francisco, California; location of works, Placer County, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 25th day of February, 1902, an assessment (No. 34) of one-half (½) cent per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, Room 31, 214 Pine street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 31st day of March, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 21st day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

GEO. W. DIXON, Secretary.

Office—Room 31, 214 Pine street, San Francisco, California.

YUBA CONSOLIDATED GOLD MINING COMpany.—Location of principal place of business, San Francisco, California; location of works, Nevada County, California.

Notice is hereby given that, at a meeting of the Board of Directors, held on the 19th day of February, 1902, an assessment (No. 6) of three cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Rooms 58-59, 214 Pine street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 24th day of March, 1902, will be delinquent and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 14th day of April, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

JAMES B. BROOKS, Secretary.

Office—Rooms 58-59, 214 Pine street, San Francisco, California.

DELINQUENT SALE NOTICE.

SILVER KING MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Pioneer Mining District, Pinal County, Arizona Territory.

Notice.—There are delinquent upon the following described stock on account of assessment (No. 23) levied on the 31st day of January, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
F. Avery, Trustee	7393	1000	$250 00
F. Avery, Trustee	7415	400	100 00
F. Avery, Trustee	7416	300	75 00
Michael Levy	7353	100	25 00
Nat. Stein, Trustee	7243	50	12 50
Nat. Stein, Trustee	7247	50	12 50
John Turnbull, Trustee	6754	100	25 00
New York Issue.			
Wm. Hyndman	89	100	25 00
R. H. Merrick	188	100	25 00
Michael Levy	1015	100	25 00

And in accordance with law, and an order of the Board of Directors, made on the 31st day of January, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, No. 310 Pine street, Room 36, San Francisco, California, on TUESDAY, the 8th day of April, 1902, at the hour of 1 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of the sale.

J. W. PEW, Secretary.

Office—310 Pine street, Room 36, San Francisco, California.

DELINQUENT SALE NOTICE.

WILLIETTA MINING AND MILLING COMpany.—Location of principal place of business, San Francisco, California; location of works, Tuolumne County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 3) levied on the 20th day of January, 1902 the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
Nolden, William	104	1 000	$10 00
Nolden, William	107	1,000	10 00
Nolden, William	108	1,000	10 00
Nolden, William	110	500	5 00
Nolden, William	112	500	5 00
Stayton, George E	116	2,000	20 00
Stayton, George E	172	500	5 00
Von Rohn, Carl		1,000	10 00
Von der Planitz, Emma	24	2,000	20 00
Von der Planitz, Emma	55	500	5 00
Von der Planitz, Emma	64	500	5 00
Von der Planitz, Emma	66	1,000	10 00
Von der Planitz, Emma	67	1,000	10 00
Trumpour, Carrie	31	250	2 50
Precbt, Charles F	40	500	5 00
Rowe, William	42	250	2 50
Newbauer, Henry R	73	1,000	10 00
Hall, James H	79	1,000	10 00
Gercke, William H	80	1,000	10 00
Beckwith, Robert	96	4,000	40 00
Schwabacher, L. A	159	500	5 00
Schwabacher, L. A	160	500	5 00
Blum, Max	161	500	5 00
Blum, Max	162	500	5 00
Heintz, J. P. E	166	250	2 50

And in accordance with law, and an order from the Board of Directors, made on the 20th day of January, 1902, so many shares of each parcel of such stock as may be necessary will be sold at public auction, at the office of the company, Room 233 Crocker Building, corner of Post and Market streets, San Francisco, California, on MONDAY, the 7th day of April, 1902, at the hour of 1:30 o'clock P. M. of said day to pay said delinquent assessment thereon, together with costs of advertising and expenses of the sale.

E. MCALLISTER, Secretary.

Office—Room 233 Crocker Building, corner of Post and Market streets, San Francisco, California.

DELINQUENT SALE NOTICE.

GARIBALDI MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Mariposa County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 2) levied on the 5th day of February, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Namee.	No. Cert.	No. Shares.	Amt.
Baker, Estelle L	59	400	$6 00
Cheney, A. L	3	10	15
Cheney, R. L., Trustee	15	10,000	15 00
Cheney, R. L., Trustee	16	10,000	15 00
Cheney, R. L., Trustee	17	10,000	15 00
Cheney, R. L., Trustee	16	5,000	75 00
Cheney, R. L., Trustee	24	500	7 50
Cheney, R. L., Trustee	26	480	7 20
Cheney, R. L., Trustee	65	1,000	15 00
Cheney, R. L., Trustee	67	500	7 50
Cheney, R. L., Trustee	68	500	7 50
Cheney, R. L., Trustee	69	500	7 50
Cheney, R. L., Trustee	70	500	7 50
Cheney, R. L., Trustee	74	1,000	15 00
Cheney, R. L., Trustee	75	1,000	15 00
Cheney, R. L., Trustee	76	3,000	45 00
Gardiner, F. A	73	1,000	15 00
Messer, A	7	1,617	27 25
Monroe, H. E	64	1,000	15 00
Porter, S. R	5	10	15
Porter & Cheney	13	20,000	300 00
Porter & Cheney	14	10 000	150 00
Reneborne, R. H	77	1,000	15 00
Reneborne, R. H	78	1,000	15 00
Reneborne, R. H	79	1,000	15 00
Reneborne, R. H	80	1,000	15 00
Reneborne, R. H	81	1,000	15 00
Reneborne, R. H	82	1,000	15 00
Reneborne, R. H	83	1,000	15 00
Reneborne, R. H	84	1,000	15 00
Reneborne, R. H	85	1,000	15 00
Reneborne, R. H	86	1,000	15 00
Reneborne, R. H	87	1,000	15 00
Reneborne, R. H	88	1,000	15 00
Reneborne, R. H	89	1,000	15 00
Reneborne, R. H	90	1,000	15 00
Reneborne, R. H	91	1,000	15 00
Wright, R. F	61	500	7 50
Wright, R. F	94	1,250	16 75
Wright, R. F	95	1,000	15 00
Wright, R. F	96	1,000	15 00
Wright, R. F	97	1,000	15 00
Wright, R. F	98	1,000	15 00

And in accordance with law, and an order from the Board of Directors, made on the 5th day of February, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, Room 15 Nevada Block, No. 309 Montgomery street, San Francisco, California, on MONDAY, the 7th day of April, 1902, at the hour of 2 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of the sale.

WILLIAM MCPHERSON, Secretary.

Office—Room 15 Nevada Block, No. 309 Montgomery street, San Francisco, California.

MINING AND SCIENTIFIC PRESS.

Whole No. 2175.—VOLUME LXXXIV. Number 13. SAN FRANCISCO, CAL., SATURDAY, MARCH 29, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Freak Mining Locations

Some big head-line type in a late paper announces "Thunder's 7000 Locations," and the text that follows says, on the authority of a pioneer prospector of the district who has just mushed out over the snow, that "almost every foot of ground for a radius of 7 miles in every direction from Thunder mountain," which is, by the way, at the top of the most inaccessible unexplored part of Idaho, has been staked out into mining claim "locations." The prospector is credited with the additional statements that everybody in the district is making locations, doing on nearly all of the claims the work required by law to make the locations valid, and that there is no claim jumping. All of this is quite enthusiastic, and probably the prospector believes all that he says is true. Is it?

Thunder Mountain district has been known for several years as gold bearing, but did not become prominent in repute for extraordinary richness and extent until late last fall just as the winter snows commenced to pile up. Up to that time, aside from the close neighborhood of the original discovery, practically no locations had been made, and there were few people in the district. The consensus of all statements as to the prospectors in the district, through the five or six months of winter, would not make the number average fifty for the entire period. This would require to make the total of 7000 valid locations that each of the fifty prospectors should make each day a valid location and sink a shaft on it 10 feet deep. The mere statement of such a proposition is its refutation as an absurdity. Under the climatic and physical conditions not a tenth part of it is reasonably possible, and not more than a twentieth part of it is probable.

Such wild, careless statements are not new with the Thunder Mountain discoveries. It is but a few years since the Buffalo Hump discoveries in the same section of Idaho were the subject of similar tales. When, in the spring following the winter of the first rush in of prospectors, the clean-up of claims was made, some freaks in locations were found that Thunder mountain is very likely to reproduce this spring. As in Thunder Mountain district, the winter snow in the Buffalo Hump country was deep—18 feet or so where the mines were. In making locations, trees projecting above the snow were blazed and marked as location and corner monuments. If the tree was not too big the top was cut off and the stump was squared down into a corner post. It happened that a locator did this in locating a claim late in the winter on top of 18 feet of snow. It is even reported that he sold it immediately for cash, the buyer going out to organize his company. He had a valid location sure, for he had himself seen the claim and the properly marked monuments on it. Later in the spring, when the snow had melted down to 10 feet or so of depth, the same location tree was seen to have another blazing, marking and discovery location notice at the 10-foot snow level, antedating, by several months, the location notice described as posted on the tree 18 feet above the surface. The original locator under this notice naturally took possession of his own location, and to save trouble topped off the tree just above his notice. It is related that he made a cash sale before the snow disappeared down to the ground, the purchaser going out of the district with the deed in his pocket to buy a stamp mill. In his absence the snow all melted and on the same tree-stump, about 4 feet above the ground, was disclosed a marking and notice of location made in the preceding fall, clearly the original location of the ground. The locator who made this original claim then appearing, resented the attempt to jump his claim, and to save further trouble topped the tree stump off about 5 feet from the ground and sold his location to a company.

It was quite a misfortune that the tree, with its three location notices, was not preserved as a freak. At the time, however, the attempted claim jumping was taken seriously, so nothing was preserved but the story, which is true, even if it has not had the publicity of print before this.

It is, of course, highly improbable that such a triple-decking of mining locations should occur at Thunder mountain, but the spring clean-up may disclose quite a little double-decking of locations made during the winter. This possibility adds a touch of humor to the vigilante notice of the old resident locators directed to the new comers, advising them for their health's sake not to make locations in Thunder Mountain district.

Whether or not the hundreds, or, it may be, thousands, of new comers will take the notice seriously is yet to develop. It is not likely that they will. The premium on sales next to the original discovery is too much of an inducement for the opportunity to be overlooked as long as the snow that remains can be banked around location trees.

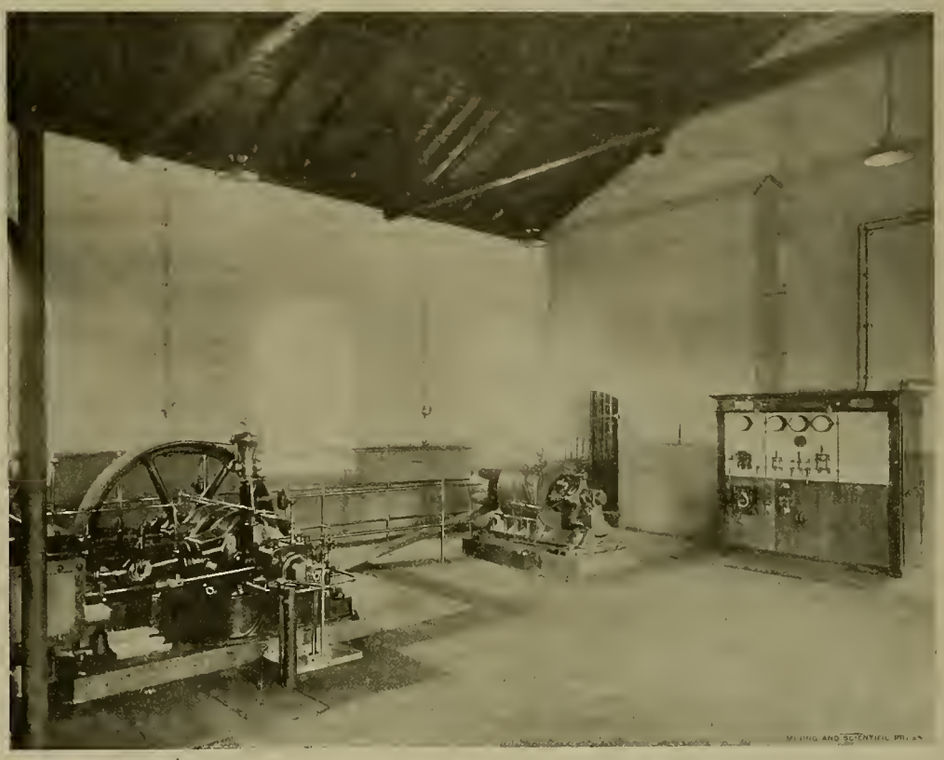


Fig. 1.—Power Plant, Thiederhall Mine, Braunschweig, Germany.—(See Page 176.)

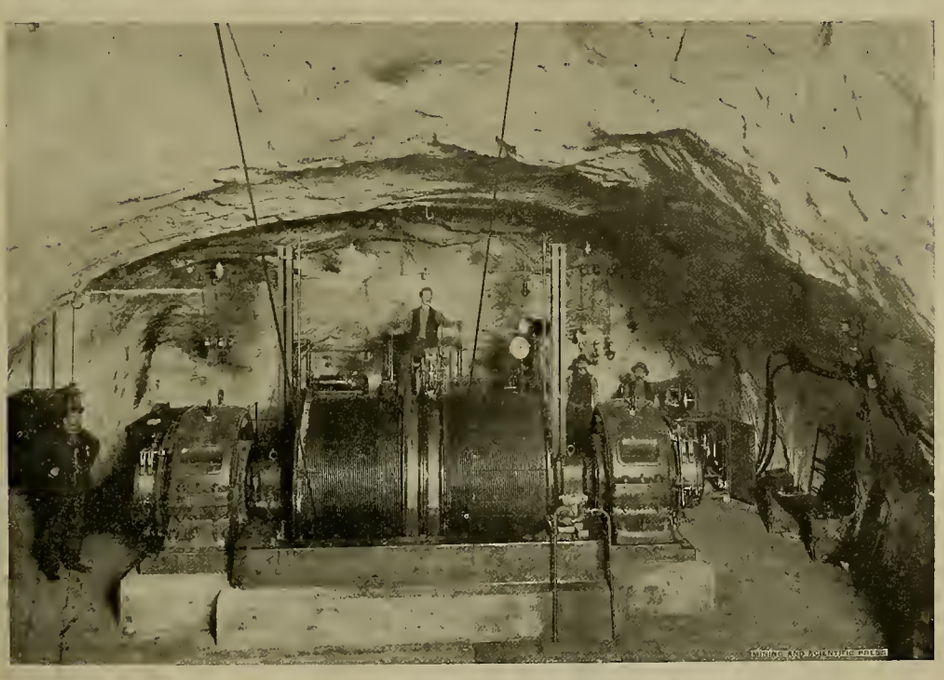


Fig. 2.—Electric Double Drum Hoist, Thiederhall Mine, Braunschweig, Germany.—(See Page 176.)

ELECTRICAL ENGINEERING is unique in the fact that while all other branches of science and engineering have had thousands of years of activity, there was nothing in ancient discoveries or inventions that led up to it. It is a product of the last fifty years.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union.....5 00

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN.....Publisher.

San Francisco, March 29, 1902.

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THE sub-committee of the Senate framing the United States mining statutes for the Philippine Islands has reported back a code under which lode locations will have no extralateral rights. A square form of location is provided for lode claims, the maximum dimensions heing 1000 feet square. It is suggested that as the metric system of measures is in use in the Philippines already that the 1000 feet he changed to 300 meters. The twenty-acre placer claims could he made ten hectares. This last would be nearly twenty-five acres. An excellent provision of the proposed law is the one limiting one person to one location on the same lode. The assessment work and patent work provisions are the same as in the United States.

THE attitude of this journal is constantly more creative than critical. It is so easy to criticise. The critic is horn ready made. Any other art or trade has to he learned. While a man, a method or a process is always the just suhject of comment, yet, ohviously, the critic is expected to do something more than merely criticise; he is naturally expected to proffer something hetter than which he condemns. This journal prefers to create and chronicle successes, and occasionally failures, which, rightly regarded, are hut stepping stones to success. Through the years it has created thousands of millions of dollars in values of mineral development, has created many splendid husiness successes in mining and metallurgy, such material creative aid heing in its line of work and field of usefulness.

THE District Court in Idaho, in a recent case arising over timher cutting on puhlic lands for mining purposes, gave instructions to the jury which defined mineral lands as a mineral vicinity where a prospector could go with a reasonahle hope of finding a mine. The decision has heen appealed in order to have the ruling of the appeal court on this definition. The question is not a new one. The definition is novel, however, as decisions in other cases which have made a definition of mineral lands, have as a rule defined them adverse to the interests of prospectors and the mining industry. This has notahly heen the case where railroad land grants were involved. A common definition has limited mineral lands to such tracts as were capahle of immediate commercial exploitation. The mines had to be known to be payahle to make the lands in which they existed mineral lands. Under this narrow, hard construction hundreds of thousands of acres of land have heen declared agricultural, patented and removed from the puhlic prospecting area by the land grant railroads, which the definition made in the Idaho case would have classified as mineral lands. A still narrower definition was that made in rulings of the Interior Department requiring that land to he classified as mineral land must he worth more, that is more payahle, for mining than for any other purpose. The decisions of the courts are superior to the rulings of the Interior Department. It connot be held that a definition of what constitutes mineral lands, with mine timher cutting the issue, can he any different from the definition with mining in the land the issue. If the Idaho District Court definition is sustained by the decisions of the higher courts, the segregation of mineral lands from railroad land grants hecomes a simpler matter and will throw open to prospecting indefinitely, much greater areas than would he the case under the other definitions.

IT is reported that the New Caledonia and Sudhury nickel mines have heen consolidated into one ownership. This makes a practical monopoly of the supply, and as the president of the United States Steel Co. is reported to he the organizer of the consolidation, it prohahly anticipates ultimate absorption hy that company. It may he assumed that the sale price of the metal will he kept where it is if not increased. The owners of nickel claims should find in this situation much encouragement to the development of their properties. It is quite probahle that under the stimulus of necessity invention will supply a cheap process of nickel ore reduction which can he installed at the mines. The successful commercial production of steel in the electrical furnace is suggestive of the direction of investigation. Much of the existing difficulty of exploitation of nickel mines has come from the large capital required to commercially reduce the ores and the fact that while there are many huyers for nickel there are very few for nickel ores.

THERE are two solutions of differences that may arise over the question of the apex, that have heen successfully applied hy mine owners interested. Some months since two large Arizona copper companies eliminated the possibility of future differences over the apex of ore veins hy making deeds, each to the other, which estahlished forever the houndaries between them as heing the vertical planes of the common surface houndary lines. The companies hoth dispossessed themselves of extralateral rights as hetween themselves. The other solution has heen by the consolidation of the ownership of the mines over which questions of the apex invite litigation. The instances in which the conflicting interests have litigated the issue to a finish hefore consolidating are more conspicuous than those in which the consolidation has heen made to avoid the litigation. Lately a disposition is developing to take the latter course. Both solutions of these possihle apex differences are to be commended. The avoidance of litigation in the operation of a mine is an economy that outweighs almost always the possible profit of successful litigation. Particularly is this the case with questions of the apex. There is hardly a known instance where the successful litigant over this question escaped serious money loss, indirect if not direct.

THE directors of the Osceola Copper M. Co. of Michigan state in their report to the stockholders of the company that the general cost of producing copper has increased nearly 2 cents a pound in the last two years, owing to the higher prices of lahor, machinery and all kinds of supplies. The statement is exceedingly interesting to copper miners, hut it is douhtful, at least, if the broad generalization should he accepted. It is assumed that the comparison is made with the ore yielding the same amount of copper, though the amount is less per ton of ore now than several years since. The ore at present being reduced yields ahout twenty-five pounds of copper to the ton. With this small quantity paying all the costs, it is apparent that a small increase in the wages of miners and a small advance in the cost of supplies could add 40 to 50 cents to the cost of mining and milling a ton of ore, which would increase the pound cost of copper produced at this mine. But if the copper product per ton of ore were 100 pounds, which is not uncommon in the Western mines, an advance of 50 cents a ton in the cost of mining would only add half a cent to the pound cost of copper. It must also he taken into account that wages of miners have not increased in Western mining districts as they have in the Lake Superior region. Wages in this region have heen and are still, with the advances made, less than in the West. It would appear, then, that while the cost per pound of copper produced has heen increased in the Lake Superior region as a result of increased wages and prices of mine supplies, there has heen no corresponding increase in the pound cost of copper produced hy Western mines from these causes. The net effect on the copper mining industry of increased pound cost of production in the Lake Superior region, coupled with lower pound sale prices, will he but to reduce the aggregate of Lake Superior copper production and increase the aggregate of production from the Western copper mines.

IT is just as important to save hrain lahor as it is hand labor. The former has very successfully applied itself to saving and economizing in the latter. It should not overlook the importance of lahor saving devices in its own processes. The value of standardization of machines and tools, the specializing of them to satisfy particular services without departing from the standards, is well understood. The reason of it is equally applicahle to the consideration of mental processes. There is so much to learn, and so much of learning that must be retained and used, that its simplification hy standardization of forms of records is hecoming of vital importance. The adoption of a standard form of commercial assay return certificate has heen suggested by this journal as heing one of the things that could he done to lessen the waste of hrain labor. The standardization of the form of keeping the accounts of mining operations would he another step toward simplifying the hrain work of mining engineers and mine managers. It should not he necessary for the latter to learn a new system for each new mine, or for the former to he familiar with all possible systems. The mine accounts kept hy a standard system would not require auditing to make them comparahle and intelligihle. A standardization of the scales of mine map drawing is a small matter, yet if there were such uniformly applied rules, the eye would soon unconsciously make the direct comparisons that without such uniformity now require the conscious, lahorious effort of the mine manager to make indirect comparisons. There is a suggestion in the proceeding for the consideration of the great engineering associations. Their adoption of standard forms would rapidly make them common and ultimately exclusive in application. There are always special interests that oppose changes. The general interest is, however, so superior that it should he controlling in this matter.

ONE of the provisions of the Treadgold concession to the Klondike placer mining territory created a monopoly of the water supply for mining. Treadgold and his associates are to bring in to the mines a stated water supply, one-half of which they may have to provide for the working of their own claims and the other half they are to sell to other mine owners at 25 cents per miners' inch per hour. This price is out of all reason for the service. For ten-hour water service it means $2.50 an inch. A ten-hour inch of water in sluicing will not wash much if anything in excess of 1½ cuhic yards, making the water charge to the yard of pay dirt from $1.50 to $1.75. Even fairly rich drifting ground will not stand such a cost charge for water to wash up the dumps, and it is absolutely prohihitive of hydraulic mining when overhurden has to he washed off to get down to the pay. The effect of the high charge permitted will he to cause the ahandonment of all hut the richest claims, the ahandoned claims hecoming at once the property of Treadgold and his associates. In early mining days of California $1 for the ten-hour inch of water was paid in a few instances to work rich gulch diggings. Later, when hydraulic mining was started, prices for the ten-hour inch ranged from 5 cents to 15 cents. There is nothing so different in Klondike conditions from those of placer mining elsewhere to justify such extraordinary charges as are fixed hy the Treadgold concession. Ditch and flume construction is not excessively costly there nor is the water season any shorter than in other districts. It is quite interesting to note that as reported the Treadgold concession does not directly mention the quartz mining which is just heginning. The 25-cent price per hour inch of water means, however, that hattery water for amalgamation will amount to $2.50 per ton of ore crushed. It would seem that the Treadgold concession has quite a good sized water bug in it.

Concentrates.

"MUSHET" steel contains 9% of tungsten.

SPIEGELEISEN is pig iron containing between 20% to 30% of manganese.

THE quicksilver production of the Almaden mines in 1900 was 30,612 flasks.

OCTAGONAL drill steel, ⅞-inch diameter, weighs 2.62 pounds to the linear foot of bar.

THE Kennedy, Amador county, is the deepest California mine shaft—2550 feet vertical.

WORK done in prospecting for placer gold on a quartz claim is assessment work for the latter.

A CUBIC INCH of water evaporated at atmospheric pressure will make a cubic foot of steam.

A PLACER CLAIM may embrace twenty acres, and eight persons can jointly locate 160 acres placer ground.

THE development of a mine is exploration. The stoping and working of a mine after it is developed is exploitation.

IF the shanks to machine drills crystallize and break, heat the shank to low red heat and cover from the air in ashes or dry sand to anneal.

THERE is danger in grasping the conductors of two alternate currents with the hands while in a dry condition whenever the difference between the intensity of the two conductors exceeds 100 volts.

UNDER U. S. Rev. Statutes, Sec. 2320, a vein or lode in a mining claim must be found in the discovery shaft, and it is not sufficient that a discovery be made on some other vein within the limits of the claim.

WITH 130 feet fall 450 cubic feet of water per minute would give, with a good water wheel, a practical efficiency of about 85 H. P. A 24-inch pipe would carry the water 1200 feet with a head loss of about 2%.

ANY citizen of the United States who may locate a claim on land in the State of Nevada, for which the State has given an agricultural patent, may hold the same providing he discovers valuable mineral thereon.

THE capacity of air for carrying moisture depends upon its volume and temperature and not upon its pressure. Air compressed to 1000 pounds pressure will contain about the same amount of moisture as the same air at atmospheric pressure.

MEANDERING a stream by an official surveyor consists in running a line on both sides which defines the channel. When not meandered by a Government surveyor, a mining claim may be located along or across its bed and patent secured in the usual way.

THE validity of land patents can only be tested by direct proceedings brought in behalf of the United States, for the reason that the Federal Government is most directly interested in seeing that the patents issued by its sanction are supported against all comers.

THE reopening of the Great Falls, Mont., smelter, is because the Great Northern railroad will change from Great Falls to the Canadian line from narrow to broad gauge, when the smelter will bid for Canadian ores. It will be rebuilt and water power substituted for steam.

A CUBIC FOOT of water heated to a temperature corresponding to sixty pounds pressure has as much explosive energy as a pound of gunpowder. It has been said that water could be boiled in a paper bag without burning the bag, but "Concentrates" has never seen it tried.

A MINING claim located in 1900, on which no assessment work was done in 1901, is again locatable in 1902 The original locator can make the relocation unless some local, district or State law prohibits it. The original locator can be a witness to a location made by some one else.

WHEN sharpening and tempering drills, leave the sets on the forge until all are finished, then heat the bits cherry red, but not the body of the steel; dip in clean water, moving slowly down, then out, leaving heat enough in the body of the drills to toughen the bits by starting temper to show color. Check color by cooling in slack tub.

ON driving pulleys of 4-inch diameter or less, a belt should be a scant ⅛-inch thick; on pulleys from 4½-inch to 8-inch diameter, the belt should be $\frac{5}{32}$ inch thick; 8½-inch to 12-inch diameter, $\frac{3}{16}$ inch thick; 12½ to 18 inches diameter, ¼-inch thick. Belts running at speeds over 4000 feet per minute should be made of single, pliable, tough, thin leather.

AS MOST of our readers know, these "concentrates" are mostly condensed technical answers to a multitude of questions weekly received from all parts of the country, the idea being to omit the question itself for the sake of space and give as correct an answer as possible, the answer being ofttimes of value to many others who want the same information as the questioner.

IN a case arising over the occupancy of land by poles and wires of an electric power line the Placer Co., Cal., Superior Court ruled that where one grants to another an oral license to enter upon his premises to establish a right of way, and that other party relies upon it, enters and makes expenditures upon the faith of it, that then the owner of the premises is estopped to revoke the license.

A LOCATION of a lode mining claim lawfully made, the center line following the known or presumed course of the apex of a lode, will hold all ledges apexing within the side and end lines together with the extralateral rights to all of them. Cross ledges will have for their end lines the side lines of the location, and their extralateral rights will thus come within a different set of planes from the planes determining the lode on which the location is made.

A LITTLE less than eleven pounds of steam and a little more than one pound of coal to the horse power appear to be the ultimate limits of steam engine economy. Gas engines using producer gas regularly yield 1 H. P. to about seven-eighths of a pound of coal. In each statement the terms are indicated horse power. The mechanical efficiency of the gas engine is now about the same as that of the compound, triple-expansion steam engine.

HEATING for forging is, in its way, quite as important as heating for hardening; care and uniformity in the application of heat in the first instance is very essential. should the steel be overheated in this operation no care afterward in hardening or tempering will remedy the evil. The blast should be watched to see that thin or exposed edges of metal do not get too much fire. In tools carrying a cutting edge, finishing cold and hammer hardening is beneficial.

THE description of screens by the number of mesh to the linear inch may be confusing unless the diameter of the openings and the kind of wire are kept clearly in mind. A mill may be crushing to 30 mesh through 30-mesh screens, No. 28 steel wire, the opening being .0171 inch, whereas a 30-mesh brass wire screen, No. 27 wire, would have openings or mesh .01458 inch, or about 15% finer. The 35-mesh, No. 27 steel wire, is about equal to a 30-mesh No. 27 wire brass screen as regards size of opening.

IN an Oregon case, Gohres vs. Illinois & J. G. M. Co., the court ruled that where a mining location was greatly in excess of the statutory limit, and the locator procured another to locate a certain part of the original tract in his own name for the purpose of making a conveyance, such action was a declaration as to where the excess in the original location lay, so that, the location of it being discovered to be void, a subsequent locator was entitled to claim that identical portion of the original location as the excess.

NATURAL DRAFT depends upon the difference in temperature between the gases inside and outside the chimney, and is greater accordingly as the smoke and gas from the furnace pass out in a more highly heated state. By use of a fan or centrifugal blower the combustion can be made more perfect, owing to a nicety of regulation of the air supply, enabling the gases to reach their maximum temperature, there being a recorded saving of 15% in some cases where fuel was expensive and the feed-water low in temperature.

A GROUP of claims is simply a working unit. Where assessment work is done on one claim of a group, or on one claim for several under the same ownership, the record of the assessment work should designate the names of the claims for which the work is done. A good way to describe them is to make a reference to the book and page of the record of the location notice. There is no legal requirement of recording several claims as a group, and it is not desirable to do it except in making record of the assessment work.

IT has been established that compressed laminated zinc made in the form of thick plates for application as an inside boiler lining is greatly superior to the old method employing pigs of raw zinc. The application of the laminated plates is made to the walls of the boilers by means of fastening strips, and are so distributed when possible that the galvanic action developed is distributed evenly over the entire surface of the iron. When oxidization is produced in any part of the boiler it is because the nearest zinc plate is too far away.

A ROUGH REFINING of crude gold bullion can be made by first melting it and pouring the melted metal into cold water, which granulates it. The granulated metal is then boiled with sulphuric acid, which dissolves out silver and copper and leaves the gold in the form of a black powder, which can be collected on a filter and melted into a bar. The silver can be obtained from the solution by precipitating it with copper. It is collected as a powder, melted and run into a bar. The copper can be recovered from the solution by precipitating with scrap iron.

A SINGLE piece of ore represents nothing but itself, and an assay made from it tells nothing except as to that single specimen. A true sample must be composed of some of each part of the original mass and in proportion which that part was of the original. It must be identical with the original on a smaller scale. In applying this to sampling ore, it must all be brought to a size, the smaller the better, thoroughly mixed and then quartered (‡) down repeatedly until the final sample is as small as is convenient to carry away. If ore is worth sampling at all it is worth sampling well, and nothing but an average sample is of any value to any one.

SOME importations into the United States of cyanide of potassium have been at different times tested for their content of sodium cyanide. Of eighty samples of commercial potassium cyanide examined, twenty-four contained no sodium cyanide, while the remaining fifty-six contained from 10% to 54% of the sodium salt, with an average in the neighborhood of 23%. It is apparent that some of the cyanide treatment of ores has been carried on not with potassium cyanide, but with a mixture of solution of potassium and sodium cyanides. A simple qualitative test for the presence of sodium cyanide in commercial cyanide of potassium is the color of the flame. A comparatively small quantity of sodium will give the characteristic yellow color to the flame, which if potassium alone were present would be blue.

FOR tempering tools heat slowly and uniformly in a charcoal or coal fire or in a furnace, so that the steel gets the same temperature throughout. If possible dip on a rising heat; that is, do not take a chisel, for example, from the hearth and wait until it becomes a little colder, but take it out of the fire at the required heat and dip at once, always remembering that the lower heat at which a steel will satisfactorily harden gives the best result both in hardness and toughness, therefore do not exceed a low red. Plain water, if clean and in good quantity, will generally harden sufficiently; if not, brine may be used.

BY a recent amendment to the corporation law of New Jersey the stock book and transfer book of every corporation organized under the laws of New Jersey are required to be kept in the regular office of the company in charge of their agent within the State. In the annual report, it is compulsory upon the officers making it to state under oath that the stock and transfer books of the company have been continually at their office within the State of New Jersey. The penalty fer a failure to make the report is a fine of $200. The law imposes a further penalty for this omission, in that it disqualifies all the then directors from holding office for the ensuing year.

THE required percentage of lead in the ore designed for a blast furnace charge is reckoned on the whole charge, ore, matte, resmelting slag and flux. With little or no zinc, arsenic or antimony, and small percentage of sulphur, there should be at least 7% lead in the charge. With silver present 10% lead would obviate considerable loss of silver. Where there is much zinc, arsenic or antimony 12% to 14% lead by dry assay is requisite. From 12% to 15% is an ordinary lead percentage for such a blast furnace charge. Usually the lower the lead contents, the higher, proportionately, the lead losses in smelting. Ordinarily, lead losses range from 6% to 12%.

SULPHIDE ORES can not, as a rule, be reduced directly by carbon, but must undergo a preliminary roasting operation to remove the sulphur, all traces of which are eliminated with difficulty. Pyrite, tetrahedrite, galena, stibnite and sulphide of magnesium are readily reduced by calcium carbide, the stable monosulphide of calcium remaining in the crucible, the metals of the ore being liberated, and, in the case of compounds of lead, antimony and magnesium, volatilize, aluminum sulphide alone being capable of resisting the powerful reducing agent. In an extension of the foregoing principle, the metals are recovered directly from the mixed sulphide ores and an efficiency of nearly 90% is obtained. If copper sulphide be fused in the presence of a suitable flux for which a blast furnace slag, melting, at about 1500° C., is found available, and calcium carbide added in theoretical proportions, the reduction occurs readily, the calcium sulphide dissolving in the slag and the copper being recovered as an ingot free from sulphur. If copper pyrites be subjected to the same treatment, it is found that the ingot obtained is composed by two sharply separated layers, of which the lower is copper and the upper iron, saturated with carbon. For ores containing zinc or other metal volatile at the temperature used, a closed retort may be employed and the vapors condensed in the usual manner. The reduction of copper pyrites by this method requires an amount of 80% carbide, somewhat exceeding the weight of the ore; for copper sulphide the carbide and ore are used in the ratio of 1 : 2.

IN the reduction of refractory metallic oxides to the metallic state, the method of Goldschmidt, of Essen, Germany, consists in mixing the metallic oxide with powdered or granulated aluminum and igniting the cold mixture in a cold crucible. The heat thus generated is sufficient to melt the reduced metal and even the resulting alumina; the danger of explosion is small. To ignite the mixture, a small hole is scooped in its upper surface, into which is put a mixture of barium peroxide and aluminum powder, relatively easy to ignite. A strip of magnesium ribbon or flash-light paper is stuck into this mixture and lit by a match. The magnesium sets the peroxide mixture off, and this starts the oxide mixture reacting next to it, and the heat thus spreads through the whole mass. In five to ten seconds the entire contents have reacted; the generation of heat is so rapid that the crucible does not become warm outside for some minutes, and it is so intense that it is unbearable to the eye, and is probably between 3500° and 3000° C. In operating on a large scale, a small amount of the powder is first ignited in the crucible, then more is continually added and the reaction kept up until the crucible is full. Then the melted alumina slag is poured off and the melted metal beneath poured out. The method is applicable to reducing to metal almost all metallic oxides, except those of magnesium, the alkaline earths and earths, and has been applied to the more expensive metals which are ordinarily considered as difficult to reduce, such as manganese, chromium, titanium, tungsten, molybdenum, vanadium, uranium and boron.

Looking for Principles Amid the Details.

Written for the MINING AND SCIENTIFIC PRESS by C. H. FITCH.

Some one has said that we can complete nothing in this world, and at most can only make a beginning and bequeath a good example. This fact of human limitation both in span of life and energy for work gives added force, when we think upon it, to a recent editorial in the MINING AND SCIENTIFIC PRESS on the subject of "Doing and Telling." The man who secretes his information is like a refractory element which resists solution. The question with him is what money the idea will bring, and if the adequate fee is not forthcoming the values die with him, as the gold which does not go into solution is carried "down the creek" in the form of tailings. The possession of money is a means to an end, an essential part of the machinery, but the real things are those that make larger men and women with greater resources for power, comfort and happiness. Money is just as necessary as a crank to an engine, but we would consider him a crank rather than an engineer, who should devote his time and talents to making a collection of cranks.

It is the greatest truth that is being "writ large" in the events of our day and generation, that we must combine, and sink the narrow proprietary thread in the broad warp and woof of goods that are "all wool and a yard wide." In the emergency of national defense, some are drafted and some volunteer. The question of the future is not whether or not we shall combine, but whether we shall combine cordially and intelligently and blend our services in the most effective way.

In mining more than in any other field the question, unweakened by levity or shifting purpose, is how to do it, to get value from the rocks. The getting of value is more serious, more "dead earnest" in mining than in other gainful pursuits. It comes closer to the fountain of gain. Unlike agriculture, it holds promise of gain by leaps and bounds, and unlike trade it is not distracted by personal relations. It brings great hopes to a focus in a single absorbing object.

In its possession of a standard of value accepted as absolute it holds the latch of the door which admits or shuts out general wealth, and general stimulus to labor and productive activity. When gold mining gains, everybody pushes forward in the hope of profit, and when gold mining lags this hope of profit is severely clipped or absolutely denied, and business effort falters, sickens, and in some measure dies, as it did when silver was demonetized.

The adventurer in mining, while pursuing his own profit, is in a larger sense keeping up the barometer of general prosperity. I do not care anything about cranks except as necessary to engines, and I care little about the profits of mining except as the means of maintaining the vital activity of all the people on a high plane.

We extol the contribution of mining to general prosperity. It is a game at which adults will play harder and keep healthier than at some other games. It is a game with rules. The rules are laws of nature, mental as well as material. To find them out and play in accordance therewith requires experiment and thought. Experiment is often expensive, and while thought will not take its place, it will go a long way toward it with a knowledge of other men's experiments. It is "up" to the poor man, or to the man wanting to become richer, to do a great deal of thinking. One of your advertisers says that no investment pays better returns for the money than printers' ink. The only exception I would make to this statement is in favor of a good thinking cap. And by that I do not mean one of these black skull caps with square pasteboards glued on to them which are worn by college alumni in processions—these are to conceal the absence of thought.

A very simple, very fruitful thought is this: Great success in mining development depends upon the combination of two elements, principles and details.

It is a matter of difficulty to grasp and hold for use the information necessary for practical success in any line of metallurgy. If we can get a working model of details which another man has proved, and duplicate these details on a similar mine with similar ore, we have a "snap," and in the success which follows we may get the maximum credit with the minimum effort. But, as observed by C. M. Fassett in a paper on ore treatment, every new case is like another blade of ribbon grass; two cannot be found alike. The man who leads his clients on the easy practical road of following details often leads them to financial disaster, and in any case fails of the best application of those details.

I have a large accumulation of articles giving details of cyanide processes, vats and tanks, slats, filters, rates of solution by agitation and percolation, and methods of precipitation, gleaned from the MINING AND SCIENTIFIC PRESS, which has more original matter on these and kindred subjects than any other paper I know, and from other papers, for example the Australian Mining Standard, in which I find many original articles by Watson, Weinburg and others as well as judicious reprints from American papers, so that if I want an extra copy of a good article from the latter, after waiting a little it comes up again like an echo from the Antipodes.

Such an accumulation is rich but exhausting; it invites so much work in codifying and comparison of its details. In business the significant thing is the price, and in the mass of ordinary correspondence of a business house it is customary to brand certain letters with a red stamp—"Quotation." So in going over these valuable records of practical experience, the whole mass of which I could never begin to remember, I occasionally put a mark "Idea." We thresh the grain, the kernel separating from the husk which has served its purpose. Many details may well be forgotten, but the ideas will add to our equipment.

The ideas designated are principles. Their only distinction from details is that they are not as rigidly definite, but are much broader. A man who grasps such a principle has in it a fist full of details, and can reproduce the details from the principles. It is a difference of degree rather than of kind. Principles may be considered as units, details as decimals. If our units figures are right we are not greatly estray, but if our figure in the third decimal place is right and the units figures are wrong, the third decimal detail does not help us a little bit in the blunder we have made.

Principles have these advantages. They are fewer, can be more easily remembered, are of more general application, safer for guidance, give one the power of reproducing details approximately in a great many different cases.

Next point. How can we get principles? If a valuable principle suggests itself to us we do not turn it out, but we do not work to pull it our way. We expect it to be heaven sent. We expect it to happen like a volunteer crop. A little boy in my family, having never before seen a colored person, came home breathless and alarmed at the sight and made the following odd statement: "I never saw him till I saw him. Pretty soon I saw him. When I saw him I run." We may say this was a child's way of putting a discovery, but we discover principles in a child's way. Some one comes along and sees and perhaps gets rich over something which we have been looking at familiarly and not seeing for many years.

Finding principles is like prospecting. It may not be certain, but the man who sits in his library is not likely to discover any actual reefs or veins. Principles come from wide observation and comparison.

The first time I read an article I often fail to see some useful principle which stands out strongly on a subsequent reading, after I have perhaps read other articles from different points of view, or allowed the subject to mellow in "unconscious cerebration."

In detail work a man is limited, even if he does an enormous amount of it. In leaching practice Mr. Tays has one line of experience and Mr. Alderson another, and their articles give us some principles and many details—much food for comparison and thought looking to results. I have seen a summary of the life work of a marine engineer, designer of a long list of steam craft. This detail work would have covered acres of paper, but it followed the lines of one general model of arrangement, and an amount of labor staggering enough to "stop the clock" of a beginner figured out in about this way. The engineer had an inventive period during which he laid down some new and good principles. His later life was spent in gardening among those same principles, and it was a very useful work. For some years I kept count of drawings which I made up to a number of about 7000—then quit, concluding that I ought to use my fingers less and my wits more.

Yet every detail that I see in proposed work calls to mind some detail of past work, something that gives me a basis of comparison even though it be foreign to the subject in hand, and the more foreign the more radical my basis of criticism and the more leverage I can bring to bear.

Many of us have accumulations of articles giving a great wealth of technical details. Most of us have these filed away for a reference which may be forever postponed. My suggestion is that we get the values out of these accumulations, that is, that we search them for principles of operation, comparing one man's experience with another's, and doing our own thinking. They are like pre-digested food, prepared for us. To provide them for us other men have spent thousands in building mills and have traveled many wearying miles. They are the fruits of a vast laboratory with some costly successes and many more costly failures, and the failures as instructive as the successes. And in them, still undiscovered, there lie valuable principles to be found by methodical search.

Details are valuable ground in which to find principles. A good principle is a nugget. Published it is a nugget that grows like the tree, which once planted will be growing when we are sleeping, aye, and when we are dead.

THE Senate Committee on Mines and Mining has reported favorably the bill devoting a portion of the proceeds of the sale of public lands to the maintenance of State and Territorial mining schools.

Smelting Arsenical Ores in Blast Furnaces.

Written for the MINING AND SCIENTIFIC PRESS by HERBERT LANG.

Some ten years ago, when engaged in smelting silver ores in a pyritic furnace, I had occasion to run down small lots of arsenical speiss at various times. Observing the facility with which this substance is decomposed, I drew the inference that arsenical materials in general might prove very easy of reduction by this means; and the corresponding one that as far as the arsenical elimination went, the products of pyritic smelting would prove purer than are usually got by the ordinary method of smelting. Subsequent experience has amply verified these conclusions, and I incorporated in my little treatise, "Matte Smelting," a resume of these views as far as they were proved at that time. During the intervening years I have collated the experiences of many persons in the various branches of smelting, but I have never been able to learn of an instance where a comparatively pure arsenical ore was subject to treatment by itself, under such conditions that the reactions and results were unmistakable. But it has happened during the past winter that an opportunity has been afforded me to observe, under desirable conditions, the behavior of such an ore.

The Slate Creek Mining Co., of Cleveland, O., owns the Blue Dick mine, a somewhat noted mineral deposit near Prescott, Arizona. The property is of considerable extent, but since the time of its early working, when the richer and more tractable ores were taken away, it has attained the name of a tough proposition. The existing ore is essentially a mixture of quartz and mispickel, containing some small quantity of other substances, such as iron pyrites, galena, chalcopyrite, a very little gray copper, spathic iron and barite. The values are in gold and silver, the copper being too small in quantity to affect the general process or result. As to the proper mode of treatment, the question has been much studied, and there has been much conflict of opinion on the matter. For lack of water and for other reasons, concentration was considered out of the question, and smelting was resolved upon. For this work I designed a furnace of advanced construction to meet the conditions, which were peculiar in these respects: The amount of water to be had, being the drainage of an old tunnel, is but a few gallons per hour, probably not one-tenth of the quantity usually devoted to cooling the jackets of even an ordinary sized blast furnace. Next, the ores, after rejecting the more siliceous part, ran nearly as follows: Silica, 45%, and nearly 17% each of iron, arsenic and sulphur; the remainder being made up of lead, copper (less than ½%), carbonic acid, etc. Limestone, which is found not far away, is the proper flux for such a mixture, and of this it is necessary to use about half the weight of the ore, in order to form a suitable slag, which by the way must, under the conditions, be quite acid in order to do the best work.

Having decided upon what slag to make, I designed the furnace to correspond, contrary to the almost universal practice, which is to buy the furnace first and then make whatever slag you can in it. I do not say that my way is the best, but I generally prefer it. As these slags were to be high in silica and lime it is obvious that they would not corrode firebricks, so that I was enabled, as a matter of economy of water, to use a brickwork lining to the greater part of the stack; and also, on account of the acidity of the slags, I made the stack of considerable height above the tuyeres, because such slags always cause fire tops on low furnaces. There is a strong reason outside of these for making an acid slag, in this, that with so much arsenic, and with the lead in the ore, there might easily be formed a quantity of speiss, which would under the present conditions of the market be quite unsalable and cause a loss by tying up values, to the company's embarrassment. The connection is not obvious to the average reader, but it lies in this, that the higher the silica the more certainty of the total decomposition of the arsenical iron and volatilization of the arsenic, which with a basic slag would undoubtedly remain to form speiss.

The furnace is a round one, 3 feet in diameter at the tuyeres, with cast iron jackets 30 inches high. Above them comes the brickwork, which extends to the feed floor, 9½ feet above. The depth of shaft from feed floor to tuyeres is 11 feet, the tuyeres being 5 feet above the slag floor. Thus the total height of the furnace is 16 feet, an unusual height, but made necessary by the character of the slags which were to be made, taken in connection with the fact that cold blast was to be used at first. The furnace is my own patented construction, having approved arrangements for handling hot air, such as covered tuyeres of a new and extremely convenient pattern; concealed blast pipes and water pipes, cast iron wind box, and underground blower pipe, etc., to obviate cooling of the blast and discomfort to the men. The crucible, according to my invariable construction, is removable, and everything about the furnace is of so convenient a character that the

stack can be blown out and in again in from two to four hours, by tbe efforts of two or three men. The jackets present an interesting feature, in that they are arranged to evaporate the water that cools them instead of discharging it hot. By tbis means the quantity required is much diminisbed, and it is found quite as practicable to run tbis stack witb tbe small amount available as it would be to use ten times as mucb and let it run away bot. Knowing tbe peculiarly penetrating effect of arsenical iron compounds I took the precaution to make tbe crucible 4 feet deep below the tuyeres. Even this inordinate depth did not save the cast iron bottom from being burned througb.

A furnace of this size is commonly regarded as having a capacity of about thirty tons a day and is spoken of as a thirty-ton furnace; but tbis apparatus smelted, witb a nine-ounce blast, fifty tons of charge per day, witb every prospect of reacbing sixty tons or upwards when everytbing falls into steady working. In tbese preliminary trials the blast is cold. Were it heated I have no doubt tbat I could put througb 100 tons a day with ease, and I see no reason wby a still greater quantity migbt not be smelted in tbis small furnace. I do not know of a single instance in tbe wbole history of smelting where a capacity of fifty tons of such an acid mixture bas ever been reacbed in a stack of this size, and as a rule attempts to make so acid a slag in a blast furnace are a failure.

The slag tbat fell from tbis smelting ran from 40% to 45% silica, along witb ferrous oxide 24% to 27%, and 20% to 24% lime. Analysis seemed to show that it was a mixture of bisilicate of lime witb sesqui-silicate of iron, witb a few per cent of sulphur, etc. As tbere was very little alumina present, tbe make-up of the slag is not obscured, and we can, for perbaps the first time, see wbat kind of slag tbe pyritic furnace makes wben left to itself.

As gratifying as is tbe quantity smelted, as well as the successful handling of acid slags, not tbe less so was the extremely bigb concentration effected—a concentration far beyond any recorded in the annals of pyritic smelting. Twenty-seven tons of ore, with its proportion of flux, produced one ton of matte. As one-balf of tbe ore consists of combustible matters (the iron sulpb-arsenides and sulpbides) it appears that the decomposition was very extensive. Nearly 90% of tbe iron was oxidized and slagged off. Fifteen-sixteentbs of tbe sulphur went up tbe chimney or into the slag; while all the arsenic was volatilized in some form or other. Vast quantities of deep yellow or red sulphide of arsenic, presumably orpiment, pass out of the smokestack, succeeded by thick masses of pearl gray fumes containing arsenious oxide, etc. A good deal of metallic arsenic also is sublimed, but tbis speedily becomes oxidized and permeates tbe atmosphere as gray smoke. Not a single particle of speiss or any otber indication of arsenic appeared at the bottom of the furnace.

Tbe matte presents no peculiarities except its brittleness, arising, I presume, from the absence of metallic iron, due to tbe bigbly oxidizing action of the blast. It carries about 10% copper, wbich is not enough for a clean saving of the silver. Measures are being taken to procure a quantity of copper-bearing ores for admixture, so as to bring the copper contents of the matte up to 25% or 30%, wbich will produce a cleaner separation of tbe silver.

I have not heard previously of such an extensive oxidation taking place in pyritic or otber furnaces as is bere indicated. The fact tbat tbe combustible components of an ore forming one-half its mass are so completely decomposed must be quite surprising to those wbo are still wondering if there is anything in pyritic smelting. Tbe pyritic principles have bad a very close application in this work, and the furnace was especially applicable to it; but I do not ascribe the success wholly to these causes. I think it is largely owing to the favorable ratio existing between tbe quantities of sulphur and arsenic existing in tbe ore, whicb in my opinion was such as to induce a very extensive sublimation of the two witbout leaving a large residue of either to combine with tbe iron. One constituent seemed to remove the otber, leaving the iron a prey to the oxygen of the blast and tbe silica of the ore, they then uniting comfortably to make the slag. I think that if tbere had been more of eitber the sulphur or tbe arsenic tbere would have been a larger proportion of matte formed and consequently a lower concentration thereof.

Tbe question of speiss formation came up simultaneously at the neighboring smelter of Val Verde, Arizona. The ores there are very easy to smelt, but certain of them carry arsenic to a small but sometimes troublesome extent. Mr. Jewett, the metallurgist, was able to smelt these without the formation of speiss, but subsequently a certain amount of trouble was experienced and my advice was sought by the manager. I advised the recalculation of the charge, establishing the silica at such a proportion as to withdraw iron from the most decomposable part of the product, which of course would be the speiss. Tbis is the same, of course, as cutting down the flux to the proper degree, which can be done by the cut and try method, the practice being in effect just what is meant by the phrase, "running a furnace by experience." The same advice, I dare say, would be applicable to very many of the furnace plants running to-day on arsenical ores. As far as I can see there is nothing necessary to the elimination of this metal than a proper composition of tbe charges, whereby silica enougb is furnisbed to take up tbe iron, which, given time enougb, will ultimately combine with tbe oxygen and tbe silica and be slagged off.

I would ask the reader's attention to the cbaracter of tbe work as I have outlined it, and tbat of the work practicable, let us say, before pyritic smelting was invented by Mr. Austin. Without the application of tbe pyritic principles, what treatment could bave been applied to the Slate Creek sulph-arsenides to extract tbeir values? In the first place they would bave bad to be roasted, as was recommended for these same ores very lately by men of experience who were dismayed at tbe amount of arsenic and sulphur in tbeir composition. Next, if the roasted material were smelted in tbe ordinary way abundance of speiss would bave been formed, difficult and sometimes impossible of sale, and then only with an attached penalty for the arsenic, wbich would bave eaten up mucb of tbe profits of the work. It was maintained by several persons, familiar with the old process but not witb tbe pyritic method, that we would get by our smelting notbing more than a very large quantity of speiss, of necessarily low value because, in their opinion, not more than four or five tons could possibly be put into one.

Tbe work at the Slate Creek property has not proceeded far, but we can reasonably claim complete success in several directions, namely, (1) as to tbe saving of water, (2) in tbe unexpected bigb smelting capacity of tbe small stack, (3) in tbe thorougb elimination of the arsenic, (4) in tbe siliceous nature of the slags wbicb the furnace successfully handles; and finally, in the unequaled concentration which it produces, putting twenty-seven tons of ore into one of matte.

A California Made Telescope.

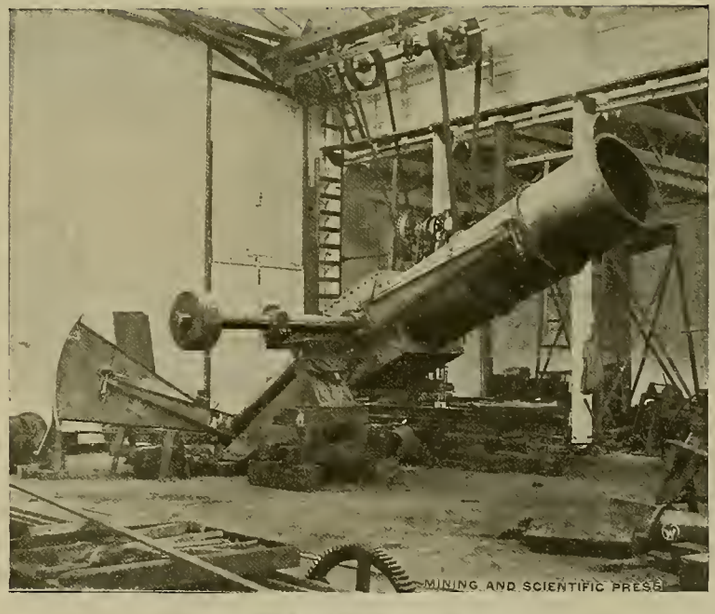
Harron, Rickard & McCone, who bave taken over tbe business of Parke & Lacy Co., tbe long established machinery firm of San Francisco, Cal., have completed a contract with tbe Lick Observatory at Mount Hamilton, Cal., for the mounting of a large reflecting telescope as represented in the accompanying illustration. Tbe great 36-inch refracting telescope of the Lick Observatory has been in use three nigbts a week since the year 1896 in connection with a photographic spectroscope presented to the Lick Observatory by D. O. Mills for determining tbe motion of the stars to and from the observer. It is one of tbe fundamental laws of the universe that every celestial object is in motion. One star is moving in this direction, anotber in that, and so on indefinitely, some with a velocity almost zero, others witb velocities as great as 60 miles a second away from the solar system. If a star is moving at right angles to the line of sight, its motion can, in the course of a few years, be detected by the usual telescopic metbods; but the component of motion toward or from tbe solar system must be measured by means of the spectroscope.

Tbe velocity of the stars are measured at tbe Lick Observatory, not from a great interest in the motion of each star, but that tbe results may be combined for many years and therefrom tbe motion of our own solar system through space may be determined. For this purpose it is desirable that observations be secured of as many stars as possible, and tbat they may be observed over the entire sky. From the Lick Observatory one can observe stars situated between tbe Nortb pole and a circle 30° soutb of the equator; but tbe stars from 30° south on to the South pole cannot be observed from tbere. It is therefore needful that a powerful telescope be located in tbe southern bemispbere, in order to extend the work to tbe Soutb pole.

In November, 1900, Dr. Campbell called the attention of D. O. Mills to the desirability of furnisbing sucb an observatory in tbe southern bemisphere, and he, with great generosity, gave a sum of money to construct tbe telescope-spectroscope, a dome to cover tbem, to defray the expense of installing the observatory in tbe southern hemispbere, and to pay the salaries of the astronomers engaged in tbe work.

As the investigations are to be made entirely by photography, it is more advantageous to make use of a reflecting telescope tban of a refractor. Acting upon tbe advice of Warner & Swasey, tbe most successful telescope builders in America, Dr. Campbell intrusted the task of constructing tbe mounting for the 37-inch reflecting telescope to tbe Parke & Lacy Co. of San Francisco. Tbe general features of the mounting, togetber with many of tbe more important tecbnical details, were designed by Dr. Campbell, but the designers of tbe Parke & Lacy Co. unified tbese plans and adapted them to the requirements of modern construction, besides supplying many devices of value.

The John A. Brasbear Co. of Allegheny, Pa., manufacturers of optical apparatus, are constructing tbe mirrors to be used in the telescope mounting. Tbe principal mirror to be placed in the lower end of tbe great tube will be of glass, 36½ inches in diameter, witb a hole 5 inches in diameter in its center. The thickness of tbe mirror will be 4½ inches, its upper surface will be ground to a parabolic form and covered with a thin deposit of silver. When tbis silver is polished it will reflect tbe light from a star, bringing it to a focus of 17½ feet from tbe surface of the mirror. If an eyepiece were placed at this point tbe image of tbe star could be observed. Such, bowever, will not be the construction of this telescope. In the axis of the tube at a distance of 4 feet below the focal point, wbere tbe diameter of tbe beam of light is still 9½ inches, a convex silver-on-glass mirror will be placed. Tbis will turn the ray backward through tbe hole in the center of the great mirror; and these rays will come to a focus 18 inches below the reflecting surface of the great mirror. Tbis point is 13 inches below the lower end of the great tube.



A California Telescope for Chili, S. A.

Tbe illustration shows the telescope so far as completed. Considerable work is still manifestly necessary, and after completion it will be erected, tested and finally sent to its destination in the vicinity of Santiago, Chile.

THE Idaho law of mining claim location requires the sinking of a sbaft or an excavation of 10 feet depth below the lower rim, and in this work 160 cubic feet of eartb or rock must be removed. Tbe ordinary shaft, 4x4 feet and 10 feet deep, or a tunnel 4x4 feet and 10 feet long, complies with the law, and 160 cubic feet is thereby removed. Sixty days from notice of discovery and location is allowed for tbis.

THE eye works equally well and sees witb equal facility witbin a very wide range of illumination. With the immensely powerful sources of light now at our command the constant tendency is to turn on more and more light irrespective of actual needs until the net result is a loss and not a gain and tbe eye suffers from over stimulation.

Placer Mining Kinks.

Written for the MINING AND SCIENTIFIC PRESS by CHAS. P. RICHARDSON.

I claim neither that the following little tricks are of the hest practice, nor that I am the original discoverer. How many other chaps in similar exigencies to mine have worked out the same ideas to the same or hetter ends, I have no means of knowing; hut never having seen any of them in print, and but one or two in practice, I send them, trusting they may save some other fellow the necessity of putting up with worse methods, or suggest to him something hetter. They have served me on a property which at the heginning of my connection with it was 120 miles off a railroad, 45 miles from a general store, 30 miles off a wagon road, with which from January to June snowshoes offered the only method of communication, and which was very crudely equipped with shops, tools and materials. If you couldn't make what you needed out of a tree, a nail, and a piece of pick steel or haling wire, you mostly went without, so I think that devices simple enough to he made there, would he practicable in most camps.

SHAPES OF SLUICES AND SLUICE PARTITIONS.—(See Figs. 1 and 2). I have heard more or less argument amongst "old timers" on wide and shallow versus narrow and deep sluices. To my mind there is no question hut that the wide and shallow is the proper sluice in any case I have seen, hoth as a gold saver and as a material handler. If not as a gold saver why have we undercurrent tahles of wide expanse for the saving of difficult materials? The wider the sluice the greater the amalgamating or riffle surface to the mining foot, and consequently the greater opportunity for every particle of gold carried through it to find a settling place. As a material handler it is equally efficacious. Irregularly shaped rocks rolling through the sluices do not travel in a straight course down the flume, hut roll more or less irregularly, now straight ahead, now diagonally, from one side to the other. As long as the rock once started holds to the middle of the flume there is little danger of its stopping, harring especially irregular riffles. It is when the rock engages the side of the flume where the current is less swift and flume side helps to impede motion that trouhle results. The wider the flume the smaller the probahility that a rolling rock will touch either side. Equally, the wider the flume the less the prohahility that a single lodged rock will result in the hlocking of the whole flume width. To my mind the desideratum is: Granted a certain flow of water, then give us the widest flume that will leave us depth and velocity enough of water to roll the largest rock that may ordinarily he piped into the flume. After this is attained then every additional inch of depth of water is a detriment, hecause the greater the superincumhent weight of water the greater the tendency of the sand to "bake" in the riffles to the prevention of amalgamation, and to form in waves on the top of the hlocks to the prevention of the free running of material. At the Moose creek placers, near Newsome, Idaho, with our best water, 600 inches, 900 cuhic feet per minute, our 30″ flume with 6½″ grade per 12′ runs 8″ deep with a surface velocity—as shown by chips dropped in—of 11′ to 12′ per second, and this handles houlders of 14″ to 16″ long and wide, by half as thick, weighing hetter than 100 pounds, though as a matter of fact we do not plan to run such heavy material ordinarily. On this same property we formerly used a 20″ flume on the same grade with water 16″ deep. I think about 700 inches—though I had no water measurements taken at the time—and we could handle neither the amount of material, such coarse material, nor with so little stoppage as with the 30″. I know of one flume 24″ wide, 60″ deep, and when the heaviest flow of water is on, the operators have almost constant difficulty with their material and amalgamation. Moreover, from the depth and velocity of the water, and the consequent inahility to work in it to advantage with hand tools, a bad jam of material in the flume necessitates the shutting the water out of the flume until the jam can be opened. This shape of flume is advocated because it will accommodate varying amounts of water.

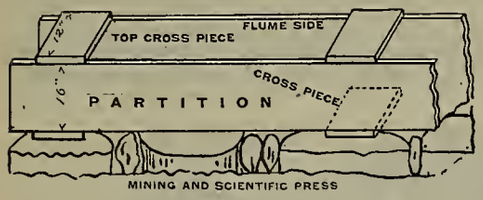


FIG. 1.

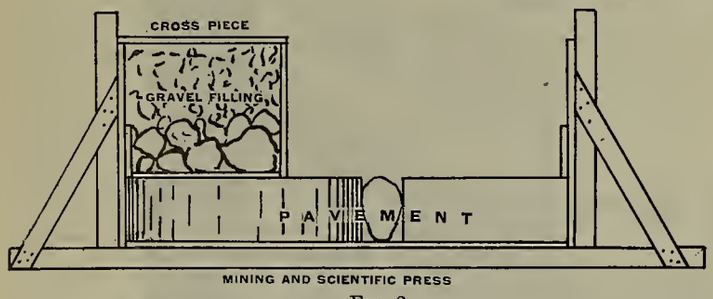


FIG. 2.

I think, however, that where there is a great variance in the flow of water available for hydraulicking at different times in a season, and a lack of proper storage or ditches to maintain a comparatively even flow, it is decidedly preferable to hold to the wide and shallow sluice and to adjust the width of one's sluices to fit the available amount of water.

I use at Moose creek placers sluices 30″ wide, 24″ deep, set on 6½″ grade to 12′ with a round hlock and rock riffle 7″ high. At the best of the season we have 600 miners' inches of water. Formerly, through antiquated reservoir ditches, we were able to throw less than 250 inches into the diggings toward the end of the season. With this small head spread over a 30″ flume bottom it was impossible to wash houlders of any size through the sluices, hut with it confined to 20″ width we could do quite a hit of effective work. I made a removable partition to reduce the width and confine the water for use with the small flow available. Taking 1″x16″x12′ lumher we nailed cross pieces 1″x6″x9″ long at distances of 3′ on one edge—which we will call the hottom edge—and at right angles to the plane of the hoard, and similarly placed cross pieces 1″x6″x11″ on the top edge. Standing the 1″x16″ on edge in the flume with the free end of the hottom cross pieces against the flume sheeting we tacked this cross piece to the top of the riffle hlocks with one or two nails, the free end of the top cross pieces was nailed to the top edge of one of the flume sides. (See detail sketch Fig. 1 and cross section sketch Fig. 2).

To prevent a tendency to rise and float off, and to make the partition more rigid, we used to fill hehind the partition with tailings by jamming the flume and overflowing the tailings hack of the partition. Short hoards set upright behind the cross pieces served as gates to hold the tailings. By removing the gates and turning clear water hack of the partition the tailings were readily sluiced out for the removal of the partition. With the cross pieces ready cut and nailed on the 1″x16″s it was the work of hut two or three hours to set up or remove the partition in a twenty-hox flume. This cut the cross section of the flume—ahove the riffle hlocks—from 30″x17″ to 20″x17″. Of course any other dimensions could he treated likewise. At first I set in the hottom cross pieces to make them flush with the edge of the 1″x16″, hut found that irregularities in the wear of the riffles nullified any such niceties, and afterward simply nailed them on, and the gravel filling did the rest.

SLUICE Y OR FORK.—I first saw Henry Pope, superintendent of American Hill placers at Elk City, Idaho, use this form of fork, and it is not unlike my partition scheme in one way. He desired to fork a 36″ hedrock flume—if I remember the dimensions—to enahle the hranches to run to different hreasts in the pit. In place of huilding half hoxes, or letting one flume into the side of the other, he began helow the proposed fork to flare the main flume. This he widened, as a head box is flared until it was 78″ hetween the standards (sides were 1½″ lumher), which would permit the entrance of hoth 36″ hranches inside the standards of the flared box without champfering the sides, or otherwise disturhing the standard size hox. After the pavement is set a removable partition similar to the one described above can be placed on the hlocks from point C in Fig. 3 to the side of the lower end of the flared box to confine the water and material to a 36″ width. This partition can readily he moved from one side of the flared box to the other to permit the use of either fork of the flume. By flaring the main flume gradually for several hoxes, and changing the angle of the flare as shown in the line D E F, as gradual and nice a curve to either or hoth the forks can be established as may be wished for, which, of course, is very essential when light grades are a necessity.

PIPE LINE PROTECTION.—In taking a hydraulic pipe line through a country with much timher which was apt to fall on and crush the pipe, and where it was inadvisable to trench and hury the line, I felled trees alongside the line, and rolled up the logs one on each side of and larger than the pipe, or raised on logs until the lengthwise log's surface was higher than the top of the pipe at that point. Smaller poles laid lengthwise on top of the pipe prevented punctures from limhs on trees falling across the line. An occasional spike or notched log kept the logs or poles from slipping down hill where the hills were steep. Although considerahle timher fell across the line, it occasioned no damage.

OPEN CUT BLASTING FOR SLUICES.—I have put in a good many hundred feet of open cut in which to lay sluices in preference to tunneling. The cut illustrated in the photograph is over 40′ deep. I prefer an open cut at even some advance in cost over a tunnel. But granted a rock that breaks well with powder and will take long drill holes, and a situation where your water can he hrought on the ground on the line of the proposed cut, and very prohahly used there in mining your higher ground, before the completion of the cut into the channel down to flume grade, then a very deep cut can he made at a very slight cost.

Open Rock Cut for Hydraulic Sluice.

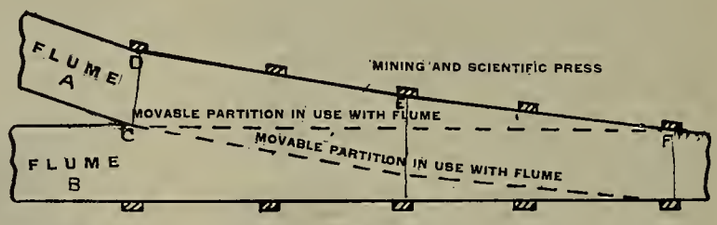


FIG. 3.

Starting the hedrock flume at the dump, running it up to the face of the rock on the line of the cut and hringing on the water, we turn the latter down the line of the cut and ground sluice all surface detritus and all picking rock through the sluices. Then heginning with hammer, steel and powder we carry forward the cut down to flume grade in one or more henches. We hreak up the large fragments of rock after each hlasting, turn on the water and ground sluice the cut clean. In the portion shot down to grade we set one or more hoxes of sluice, and repeat the operation. As soon as enough of the hedrock flume is completed to save our gold values, we begin hydraulicking such ground as lies trihutary to the uncompleted cut. By using stagings to work from, holes are drilled at the water's edge into the bottom of the cut and hlasted, and the carrying forward of the cut and hydraulicking go on together. The passage of the gravel washed down the cut helps to wear down the softer portions of the rock. The hard reefs are shot, to induce further wear in the softer portions. The ahility to handle the debris from the hlasting through the sluices hy water reduces the cost of the cut driving practically to the cost of the drilling and hlasting, and makes it possihle to put through a cut, especially if it he a long one, involving the handling of an enormous amount of material at a lower cost than the driving of a tunnel of similar length. This, of course, is especially true where hydraulicking can be carried on simultaneously with the cut making.

We use practically no timher. Occasionally a had

point is held up hy a stull or two until the necessity for the frequent passage underneath of men is past. Then we knock the stull out and let the sides come in until they reach a safe slope. Some breakage of flume sides results from these caves, but I have yet to have the important thing, the flume hottom, injured. With the cut filled and tamped solidly on the sides of the flume to the top of the latter with rock and gravel, which incidentally prevents the flume from rising in case of a flooded cut—the force of the caves largely goes over the top of the flume sides, and filling the flume results in comparatively little damage. With a flume thus set you can rest calmly when you see it filled and covered over 20′ deep with a cave, knowing that when the water finally hacks up and goes over that cave it will take it out with no damage to flume or works. No cave from the top can "plug your tunnel" in case of an open cut, nor can the washing down of stumps, timhers, houlders, or the efforts of an enthusiastic pipeman do the same thing, necessitating hours of anxious, and, if a hody of water he held hack of the plug, extremely hazardous, work to all engaged in reopening the plug. Under ordinary conditions with an open cut the pipeman can adjust his work and the running of the whole diggings by watching the way in which the sluices are handling the material piped to them. There is no call for repairs on the cut itself, the necessity for repairs on the sluices is more readily seen than in a tunnel, and one has daylight to assist him in his most delicate work—cleaning up. He also has daylight to assist in the protection of the sluices against the employe with hazy notions as to whose property the amalgam ought to he, especially at clean ups. Of course where the depth of the rock to be driven through is excessive, an open cut is out of the question.

(TO BE CONTINUED.)

Patching Old Boilers.

A much ahused piece of mechanism is the ordinary every-day steam hoiler. Where the fuel expense is as a whip to induce attention, it is had enough, but if some of the boilers that serve long periods in the country, where fuel is no object so long as the steam is supplied, could talk, what tales of abuse they could tell. The ahuse may hegin hy the purchaser objecting to first cost and wanting one cheap, the consequence heing that to please him must lead to inferior workmanship or material, or hoth; the hoiler starting out on a sort of false standing, for the purchaser will expect as much out of it as if he had paid the highest price, and will feel that the saving in price is to the credit of his business tact alone. Then when the end comes, when it is desired to replace the old hoiler with a new one, the owner asks the dealer what he will allow for the old one in exchange, and the poor old hoiler receives an insult on top of its long line of injuries hy having itself rated at the same price as old iron or junk.

In the first place, that called a safety plug with which all well regulated boilers are supposed to be supplied, is not always safe; that is, it does not perform its functions. In theory, the safety plug is all right, heing a plug of fusihle metal put into the hoiler at such a point that when the water gets so low as to he called dangerous, the plug will he left dry, and the heat of the fire will melt it out hefore any serious danger arises to the rest of the hoiler. In practice this is not horne out, still it is generally used, and retains its name of a safety plug. That this same safety plug is closely connected with hoiler patching is too plain to escape notice. There is a continual exemplification of it in the everyday life of hoilers that go out for service when the safety plug is put in the crown sheet over the fire. These boilers generally fail first in the crown sheet, and then comes the patch.

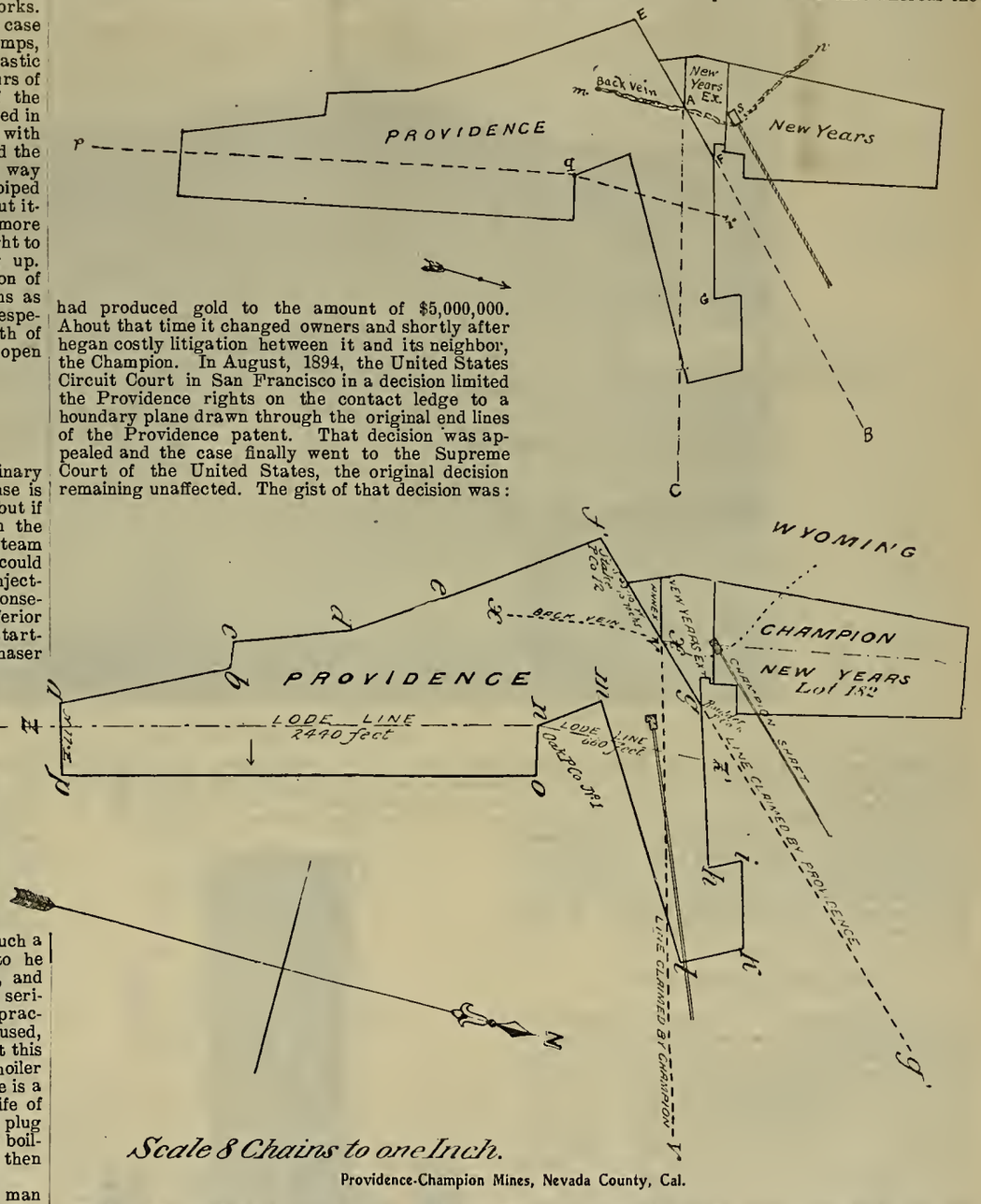
The same idea of "economy" that induces a man to get his boiler at as low a price as possihle will likely prevent him from sending for a hoilermaker to come and put on a patch, if there is any possible way to avoid it; and it is often avoided hy calling in the local hlacksmith to do the work. There is a case in point in a hlacksmith journal, in which a blacksmith tells his hrother smiths how he patched a hoiler. He says the crack was in the top of the fire hox, right in line with and a little hack of the safety plug (note the position of safety plug). He drilled holes at the ends of the cracks to prevent spreading and then put on a patch of plow steel, with a coating of lead and horings between it and the shell to insure against leaking. In fact, he simply did what is known to the engineering trade as soft patching, which should never have a place where it comes in contact with the fire, and this one was evidently in the extreme heat of the fire. An engineer would say that the thing to do in a case of this kind is to cut away the old metal, avoiding square corners in the hole, and then put a hard patch on the inside and calk the seam in the old shell. True, circumstances might he such that the patch could not he put in the inside, but if it could not and a good job could not he had hy cutting away the old metal and putting a patch on the outside it was time to put in a new sheet altogether.

Two California Gold Mines.

Written for the MINING AND SCIENTIFIC PRESS.

The reported sale of the Providence mine, Nevada county, Cal., to its neighbor, the Champion gold mine, is of interest, even in a county and section where continuous yield of gold for fifty years is of usual occurrence.

The Providence mine, on the opposite side of Deer creek from its purchaser, the Champion, was located in 1858 and followed the usual course of California gold mines, at one time all operations having heen suspended and the property offered for sale for $60,000. Up to 1890 it was estimated that the mine had produced gold to the amount of $5,000,000. Ahout that time it changed owners and shortly after hegan costly litigation hetween it and its neighbor, the Champion. In August, 1894, the United States Circuit Court in San Francisco in a decision limited the Providence rights on the contact ledge to a houndary plane drawn through the original end lines of the Providence patent. That decision was appealed and the case finally went to the Supreme Court of the United States, the original decision remaining unaffected. The gist of that decision was:



Providence-Champion Mines, Nevada County, Cal.

"When the end lines of a mining location are once fixed, they hound the extralateral rights to all the lodes that are thereafter found within the surface lines of the location."

In a former decision of the United States Supreme Court, in the case of the Iron S. M. Co. vs. Elgin M. Co., it was decided that the same end lines hound all extralateral rights as to all veins or lodes within the surface houndaries of the claim. In delivering that opinion Justice Field, speaking of the rights of locators of mining ground to follow the lode in its depth, said: "It often happens that the dip or apex of more than one vein lies within surface lines, and their veins may have different courses or dips, yet his right to follow them outside of the side lines of the location must he hound by planes drawn vertically through the same end lines. The planes of the end lines can not be drawn at right angles to the courses of all the veins if they are not identical."

The Providence-Champion suit was for $300,000 and damages, the former claiming that the Champion had gone under the surface into the Providence ground and unlawfully extracted ore therefrom. The decision noted was in favor of the Champion.

Under the circumstances some details and diagrams are of interest:

A patent was granted hy the United States in 1870 to the Providence lode, shown on the diagram at P, Q, R (Cut No. 1); also to the piece of surface ground marked Providence. On this vein an incline shaft was sunk 1500 feet deep and extensive mining operations carried on. From this shaft two crosscuts were run 600 feet to the west, and another vein opened up and worked hy the Providence M. Co., this back vein having its apex on the line M, S, N.

On this vein, at the point S, the Champion M. Co. sunk a shaft 1000 feet deep on the pitch, extended its works and took out ore south of the line E–B.

The plaintiff asked for an injunction to restrain defendant from working south of the line E–B, and for damages for ore removed south of said line, placing damages at $300,000.

The contentions of plaintiff were that whereas the Act of 1866 only granted to the Providence claim the lode P, Q, R, the mining Act of Congress of May 10, 1872, gave it the additional grant of all other veins the apexes of which were situated within the surface lines of said claim, with the right to follow the same on their dip to any depth, and that the line E–F, which is crossed hy the apex of said vein, is the end line on said vein, and that the right to follow said vein on its dip and strike is limited by a plane through said line E–F and its continuation.

It was further claimed that a location made by the Champion M. Co. in the year 1884, containing a clause of abandonment south of the line E–F, made said line a compromise line, and that defendant was deharred from asserting any rights south of said line. The defendant contended that the line E–F is a line which limits the claim of the Providence mine to said vein on its strike, hut that the rights on the dip are limited hy a plane passed through the point A and parallel with the line F–G, being the line crossed hy the patented lode P, Q, R; that the claimed abandonment was not of such a nature as to make the plaintiff a party to same, and that when defendant ohtained from the land office the receiver's receipt for a patent it gave a new title, which barred any claimed compromise.

The portion of the mine in dispute was that portion

of the back vein included in the lines A–B and A–C. The peculiarity of this action relates to the numerous irregular shaped pieces of surface ground which were patented to mine owners under the Act of 1866 and the application of the Act of 1872 and the decisions of the courts thereunder, the difference between the two Acts being that under the law of 1866 a patent was granted for a number of feet of a vein, with a piece of ground for working purposes, which could be taken in any shape. Under the Act of 1872 a piece of ground is patented which is practically supposed to be a parallelogram containing a vein.

In Cut No. 1 the line E–F–B is the one claimed in the original suit by the Providence; the line A–C is the one claimed by the Champion; the line F–G shows the boundary fixed by Judge Hawley in the decision from which appeal was taken. The United States Circuit Court of Appeals affirmed the decision of the lower court.

The Champion, which now acquires 147 acres additional, is a notable mining property. It now owns twenty-four claims. Its hoisting plant is of capacity to sink 3000 feet. Its methods are modern and it has a lifetime record for profitable yield. The property is typical of the best class of California gold mines, well equipped and well managed.

Champion Mine, Nevada County, Cal.

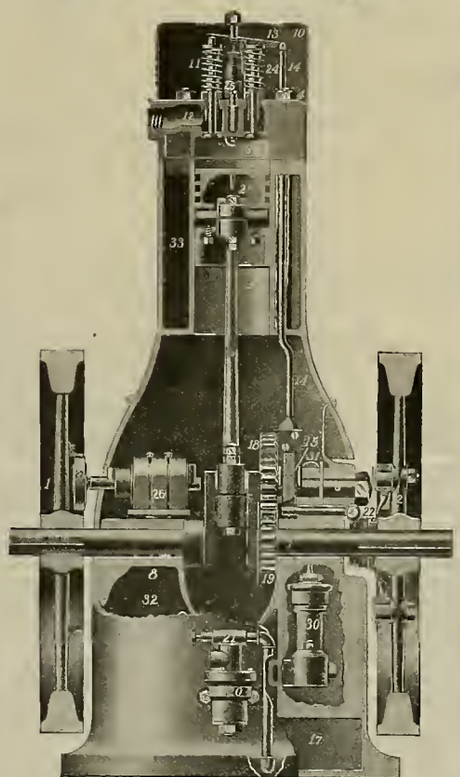
Electrolytic Separation of Tin.

A curious parallelism is presented between the well-known Hoepfner process for the extraction of copper from its ores and compounds, and a method just patented to Paul Bergsoe of Copenhagen for the electrolytic recovery of tin from scrap and waste alloys. The Hoepfner process, it will be recalled, depends upon the varying valence of copper, and consists in bringing a salt of copper in its higher state of oxidation into contact with the ore, whereupon copper passes into solution and the solvent is reduced from the cupric to the cuprous condition; this solution is then electrolyzed with insoluble anodes to deposit one-half of its metal, restoring the remainder to its original valence and reconstituting the solvent. Bergsoe reacts upon tin-bearing materials with stannic chloride, and subjects the stannous salts formed to electrolytic treatment as above, restoring its valence and solvent power, and recovering an amount of metal equivalent to that dissolved. Both methods are simple, and indeed identical in theory. The Hoepfner process has encountered in practice the very serious obstacle of a low-reaction velocity—a solvent action so slow as to render its application to the most commonly occurring ores of copper, the sulphides, of doubtful practicability. From this defect the new process is free, for the stannic salts are energetic solvents. The successful treatment of tin scrap, however, has proven in the past a difficult problem, not only on account of its very low tin content, but because of the tendency of the iron to pass with the tin into solution. As applied to this purpose, therefore, the industrial value of the new process is yet to be demonstrated.—Electrical World.

It is estimated that $90,000,000 represents the investment in machinery in the gold mines of South Africa.

The Hardy Motor.

In the sectional view of the Hardy motor herewith Fig. 1 shows the balance wheel magneto side; Fig. 2, governor side; Fig. 3, combustion chamber; Fig. 4, combustion chamber stud; Fig. 4, connecting rod, made of steel, adjustable bronze sleeves at each end; Fig. 6, countershaft for pump and exhaust valve rod; Fig. 7, crankshaft; Fig. 8, crankshaft bearing; Fig. 9, cylinder; Fig. 10, cylinder cap of brass; Fig. 11, exhaust valve; Fig. 12, exhaust outlet; Fig. 13, exhaust valve arm; Fig. 14, exhaust valve rod; Fig. 15, exhaust valve cam; Fig. 16, exhaust valve roller on end of exhaust valve rod to prevent friction and side motion; Fig. 17, gasoline reservoir, holding about six quarts; Fig. 18, gear on countershaft; Fig. 19, gear on crankshaft; Fig. 20, gasoline and air mixer; Fig. 21, generator needle valve for regulating gasoline and air mixture; Fig. 22, governor, ball type, two movements, straight line; Fig. 23, governor speed adjustment for changing speed of engine while running; Fig. 24, inlet valve, opens only when governor allows exhaust valve to close; Fig. 25, igniter; Fig. 26, magneto for making spark; Fig. 27, magneto friction wheel, operates by contact with balance wheel; Fig. 28, piston, three spring rings, wrist pin for connecting rod, adjustable to wear, receives oil from cylinder lubricator; Fig. 30, pump for pumping water to cylinder and combustion chamber water space; Fig. 31, pump eccentric strap; Fig. 32, water reservoir, holding three gallons, to keep engine at proper temperature on all day run; Fig. 33, water space around cylinder.



Sectional View of Hardy Motor.

The Thiederhall Electrically Operated Mine.*

Among the practical electrically operated mines in ermany is that at Thiede, near Braunschweig, hich is equipped with direct current dynamos and motors constructed by Siemens & Halske of Berlin. The mechanical apparatus was installed for the Thiederhall Co. by the Nordhauser Machiue Co., formerly Schmidt, Kranz & Co. The electrical generating plant, noted in Fig. 1, is equipped with a high-speed engine operating by belt transmission a continuous current generator. The current is conducted through the switchboard noted in the background of the illustration to a storage battery plant located in an adjoining room. This set of accumulators is used as a regulating battery, and the current is conducted through cables to the various mining machines, pumps, hoists, etc., in different parts of the mine.

The electrically-driven hoist is shown in Fig. 2, and one of the two motors will be seen, which are directly connected to the winding drum of this hoisting apparatus. These motors are operated upon a 500-volts power circuit, and each have a capacity of 150 H. P. normal load, but are able to carry a heavy overload without difficulty.

These motors are shunt-wound, and are intended to work and elevate the various loads at different speeds from 113 mm. to 7.1 m., about 25 feet, a second. The weight of the hoisting cable per metre of length is 1 5 kilograms. The cable operates at normal speed of 6 m. per second, while the cages make 32 trips an hour. The weight of material handled during each eight-hour shift is about 200 tons. While conveying men up and down the shaft the highest speed allowed is 3 m. a second. The total depth of winzes operated by the electric hoist is 200 m.; its extreme depth below the surface is 500 m. In the upper shaft, 300 m. deep, a steam hoist is used.

The variation in speed of the hoisting motors is accomplished without using a controlling rheostat or resistance of any kind. For normal working two speeds are secured by placing the motors either in multiple or in series. While working at the high speed hoisting ore a speed of 6 m. a second is possible, while the lower speed of 3 m. a second is always used in taking the miners in and out of the mine. The two hoist cables operate two cages at the same time—one drum winding while the other unwinds. On the outside of the motor the commutator is arranged, and the armature is connected to the drum so that a new one may be placed in position in the shortest time possible. An extra armature is always at hand which can instantly replace an old one in case of accident.

Great braking effect when necessary is produced

*See Illustrations on Front Page.

by the operator at the switches which connect the motors, so as to operate them as generators supplying current to special resistance, bringing the hoisting drum to an almost instant stoppage. The absolute control of the hoisting apparatus by the electric motors is beyond the possibility of a hoist worked by steam. The hoist is fitted with two special brakes—one for usual work and another for use in case of accident as a safety brake. The first can be directly set by a foot lever controlled at the operator's stand, or indirectly by hydraulic apparatus. The water pressure required for the hydraulic operation of this brake is supplied by a small pump connected to the hoisting-drum shafting by an eccentric. The safety brake begins to operate when the cage is within 20 m. of the end of the shaft. An automatically tripped lever controls the motors, operating them as generators, thus constituting an electric brake. This lever may also, in case of emergency, be operated by the engineer.

Besides this arrangement an electric-signal gong is rung as soon as the cages arrive at the 20 m. mark in the shaft, thus notifying the operator to apply the foot or hydraulic brake at once. The upright instrument standards, shown in Fig. 3, support a voltmeter, an ammeter and a tachograph; this last mentioned indicates the speed of the cable.

The capacity of the generator in the power house is 60 H. P., while the motors sometimes take 300 H. P. in raising at their full capacity through the shaft. Of course, in this case, the storage batteries take care of the additional load for the required brief space of time. Such a plant, it is stated, is not only extremely reliable, having always a current supply in the accumulators in case of accident to the dynamo plant, but also that the original cost is much less for boiler, engine and generator machinery.

The steam hoisting apparatus even, in the first shaft, may be electrically operated, if required, because the dynamo in the generating station may be worked as a motor from the accumulator, in turn driving the hoisting machine of this shaft.

The highest speed at which this electric hoist is capable of working is 7.1 m. a second, by regulation with motors in parallel, while there is a medium speed with the motors connected in parallel at 6 m. a second. The greatest speed, when the motors are connected in series, is 3.6 m. a second, with a medium-series speed of 3 2 m. a second. The speed may be lowered to 113 mm. a second for repairs and inspection. The manufacturers guaranteed a total speed of 32 trips an hour, while in actual practice it has been found possible to guarantee 81 trips, or 2.5 times as many.

In the power house the generator is kept running continuously, whether or not the hoisting or other mining machinery is at work. The accumulator is steadily charged by the surplus current, while the apparatus in the mine is working under light load, or the hoisting machines are not in operation.

A most essential feature of a great mining system is the telephonic equipment and signal apparatus, which must be durable and of the highest grade. It is essential that all signals be accurately transmitted, and that it be possible to hold communication with all parts of the mine unfailingly and instantaneously. The serious consequences which would many times result from any failure of this class of apparatus have caused great care to be taken in the installation of the telephones and signalling indicators. Means are provided for connecting the telephones under ground to the cables by metallic boxes, which are moisture proof, and additional precautions are taken by placing the whole equipment in another case where the apparatus is in special danger.

The person who attends the hoisting machine at the elevator shaft is supplied with both automatic indicators and telephonic apparatus.—Condensed from Electricity.

Mining Statutes for Philippine Islands.

The Senate Committee on the Philippines has accepted the report of the sub-committee, consisting of Senators McComas, Deitrich and Rawlins, appointed to prepare a plan for disposing of the mineral lands in the Philippine islands and prescribing the conditions of mining in those islands, and the plans suggested will be adopted as a substitute for the portion of Senator Lodge's bill dealing with this subject.

The substitute does away with extralateral rights to lode claims. The locator of a lode or vein is allowed to enter a tract of land 1000 feet square, and he is required to plainly mark his claim with posts. Record of claims is to be made with the Secretary of the province in which they may be located. No one person is to be allowed to make more than one location on the same lode, and the surface land and timber are to be used only for the development of the lode. It is required that not less than $100 worth of work shall be done on a claim each year. To secure a patent on a claim $500 worth of work must be done. Placer claims are limited to twenty acres of land for individuals and 160 acres for associations, and authority is given to enter petroleum or building stone land under this provision. Entries of coal lands to the extent of 160 acres are authorized.

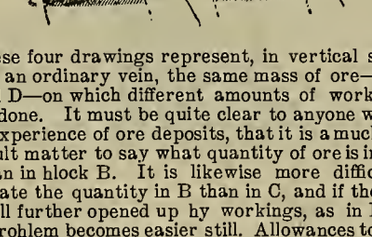
Ore in Sight.*

By J. D. KENDALL.

The estimation of ore in sight is very far from being one of the most difficult matters with which an engineer has to deal. Yet some of the most serious losses in mining have been incurred through errors in such estimates, and engineers have, very properly, been most severely censured for their failures in this connection. It is therefore proposed to bring the matter before the Institution with a view of making some recommendations which, if followed, will in the future greatly reduce, if they do not prevent altogether, the losses which have so frequently arisen in the past from the so-called estimates of ore in sight.

DEFINITION OF TERMS.—Ore in sight is an expression of very common occurrence in reports on mines. The meaning attached to the phrase does not appear, however, to be always the same. In some instances the so-called "ore in sight" is only "ore in imagination." The former expression, it is true, is not a happy one, for the ungotten ore of a mine can never be all in sight even when "blocked out" in the most complete manner possible in the regular working of mines. No matter how small the pillars, or masses of ore, blocked out may be, there must always be a large proportion in the interior of them which can not be seen. But if a person of experience can see the four sides of a rectangular mass of ore, in a vein, for example, he can, in the great majority of cases, form an estimate—not absolutely accurate, it is true, but sufficiently so for commercial purposes—of the quantity of ore contained in that pillar. He may in some cases be able to do so if he can only examine three sides of the ore mass, or again even when only two opposite sides are in view; but in each of these cases he will have to employ a different factor of safety. This factor will also vary with the size of the mass under consideration. These remarks may be extended to ore bodies of other shapes. On the other hand, if only one side of a mass of ore can be seen, it must be perfectly clear that no one can tell what quantity of ore is in that mass. The side visible may show a large area of ore, but quantity of ore involves a third dimension. If this be wanting, we can not possibly know anything about quantity. The third dimension, so often unfortunately assumed, can only be ascertained, with an approach to accuracy, by "blocking out," so that "ore in sight" may be looked upon as synonymous with "ore blocked out."

By blocking out is meant the exposure of ore on two, three or four sides of a rectangular or other shaped mass, as is partially shown in the following diagram:



These four drawings represent, in vertical section along an ordinary vein, the same mass of ore—A, B, C and D—on which different amounts of work have been done. It must be quite clear to anyone who has had experience of ore deposits, that it is a much more difficult matter to say what quantity of ore is in block A than in block B. It is likewise more difficult to estimate the quantity in B than in C, and if the block be still further opened up by workings, as in Fig. 4, the problem becomes easier still. Allowances to cover any possible error from nips, intrusions or inclusions, would have to be greater in the case of A than in that of B, and greater for B than for C. The allowances must, in fact, be inversely proportional to the amount of blocking out. They must also vary as the distances apart of the exposed sides vary. For example, in the case of No. 1, if the tunnel were 200 feet below the surface at block A, the estimation of the probable amount of ore in that block would be much more difficult than if the depth were only 50 feet, and therefore greater allowances for possible variations must be made. The same remarks apply to the other figures. The extent of allowance—that is, the factor of safety—depends largely upon the character of the deposit, and must be determined on the spot for each particular case.

Blocking out does not mean simply the exposure of ore by trenches, tunnels, drifts, winzes and raises, but includes also the exposures that sometimes result from denudation.

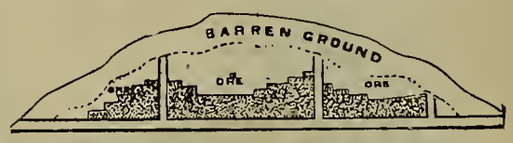
WHY BLOCKING OUT IS NECESSARY.—Owing to the very irregular manner in which ore deposits usually occur, no one can, as a rule, form even an approximate idea of their extent until the boundaries have been determined by actual work. But even if the main or outside boundaries of a deposit be known, there is still much to be learned with regard to the inside boundaries, for most, if not all, deposits contain more or fewer or larger or smaller inclusions of country rock, or other barren ground, about which we can not know anything until the deposit has been more or less blocked out.

Variations also occur in the quality of ore in different parts of a deposit, so that the more we see of it and the more samples we can take, the more likely are we to arrive at the average quality of the workable portion of it.

The man who has not from experience realized the truth of the above statements will be apt to permit his fancy to form his facts, and so reach conclusions which will most probably be altogether unreliable; for he will assume extensions which may not exist, continuity where they may (and probably will) be great interruption and uniformity where there is great variation.

A few of many instances that have come within the writer's experience will now be given of the unreliability of estimates of ore in sight which are made when the ground under consideration has been insufficiently blocked out.

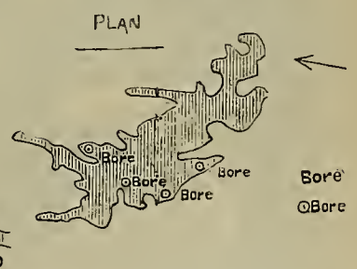
ILLUSTRATIONS OF ERRONEOUS METHODS.—The first illustration relates to a deposit of argentiferous galena, which occurred as a vein. The diagram below gives a section along the vein, and shows the amount of work done at the time the engineer of an intending purchaser made an estimate of the ore in sight.



Had the vein carried ore at the surface, it would have been fairly safe to infer that the ore in the back of the stopes would extend to the surface; but, without satisfying himself of the existence of ore in the vein at the surface, the engineer referred to assumed that the body of ore he had seen in the stopes would extend out to "day." Had he taken the trouble—as he ought to have done—to ascertain what really was on the surface, his estimate would have been very different from what it was, if, indeed, he had thought it possible to make one. The writer followed soon after with the same object; but, failing to find any ore on the surface—that is, lacking the third dimension—did not make an estimate, because the ore above the stopes could not be said to be in sight.

When the stopes were extended upwards, it was found that the ore actually nipped out along the dotted line in the diagram.

Another instance is in connection with a deposit of hematite. The deposit had been discovered by means of boring. Hematite had been found in five holes at the points shown in the following diagram:



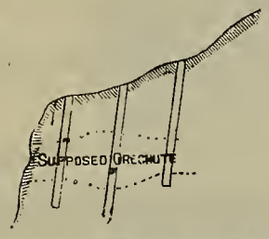
It was assumed that all the bores which passed through ore were in one and the same deposit, that the deposit extended literally much beyond the bores, and that therefore a body of ore containing at least 650,000 tons had been "thoroughly proved"—to adopt an expression made use of in the report prepared for the sale of the property—which expression may be considered as another way of writing "ore in sight." This estimate led to a very serious lawsuit, for when the deposit was practically exhausted only 41,879 tons of ore had been raised, the lateral extent of the deposit being shown in the above diagram. To assume that all the bores which cut hematite were in one deposit was to disregard entirely all experience of such deposits. But, further, the founding of such conclusions so important, financially, on such insufficient data is most reprehensible. If the ore had been more thoroughly bored, or blocked out by workings, before any estimate had been attempted, no such ruinous mistake could have been made.

Let us now consider an estimate of ore in sight relating to some gold-bearing veins. In its disregard of facts and its confident reliance upon assumption, this is, perhaps, the most reprehensible instance that has ever come under the writer's notice. One vein could only be seen for a length of about 50 feet

*From a paper read before the Inst. of Mining and Metallurgy.

in a trench about 4 feet deep. The width of the vein in the trench was about 18 inches. On these data it was assumed—for prospectus purposes, it ought to he said—that the vein contained 1,000,000 tons of ore. There were three other veins in the property which —also for prospectus purposes—were assumed to contain over 4,000,000 tons of ore, although there was not sufficient work done on them to thoroughly prove the existence of 4000 tons. In this case we have not simply the assumption of the third dimension, the whole three are assumed. Can we wonder that severe things are sometimes said of those who make such an unscientific use of the imagination. Whether it be from incompetence or dishonesty is immaterial, the final outcome is alike disastrous commercially. That any competent person ever made such an estimate is incredible, and that anyone should issue such an estimate to the public, after its utter unreliability had been pointed out fully, is, to say the least, most discreditable.

Another instance may he given to show the risks that are sometimes run in estimating quantities on a minimum of information. The vertical projection below was suhmitted to the writer by the owner of the property to which it related, with a view to sale.



An ore chute was represented as existing in the form indicated ahove and a quantity given, corresponding thereto, as ore in sight. When the writer examined the mine he found that no chute existed. The country rock was limestone, in beds 2 to 4 feet thick, standing nearly on end. The overlying rock was igneous. The ore, a highly argentiferous galena, occurred interruptedly along the bed planes of the limestone, as shown helow in plan, on an enlarged scale.

The different lots of ore seen in the uppermost tunnel were not on the same hed planes as those in the level helow, which again differed from those seen in the hottom tunnel. Moreover, ore occurred outside the supposed ore chute altogether. As a matter of fact, there was not a scrap of evidence on hand to show that such an ore chute, as was assumed, existed. Not one of the lenses of ore extended from one level to the other. Had the ground been further blocked out hy a numher of raises, the invalidity of the inferences drawn with regard to the supposed ore chute would have been demonstrated.

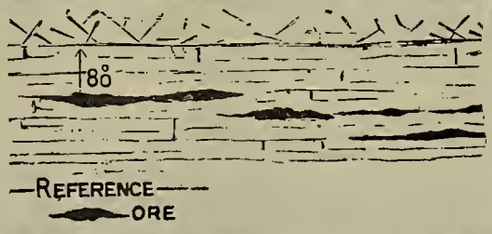
LOSSES RESULTING FROM OVERESTIMATE.—Excessive estimates of ore in sight not only enahle promoters to ohtain exorbitant prices for their properties, but most prohably induce the purchasers to erect expense treatment plants, which soon become useless where they stand, and often altogether valueless on account of the cost of removing them. Both these results cause unnecessary expenditure, which means avoidahle loss, and, therefore, they are highly detrimental to honest mining. To put it on no higher plane, that ought to be quite sufficient to induce engineers to keep their estimates within the hounds of fact.

SUGGESTIONS.—As a rule, statements as to the quantity of ore in sight, like many other statements in reports, are made so that there is no possihle way of checking them without going on to the ground. You have the simple statement that there are so many tons of ore in sight, and you are expected to accept it. That is not as it should be. Every statement of such quantity should he accompanied hy an accurate plan and vertical section, on a working scale, which shall indicate the extent of ore to he estimated, and show clearly the ore which is known to exist, as distinguished from that which is only inferred. The width of the pay chute should be marked on the section at equal distances apart. Samples should also he taken at equal distances. The frequency of hoth will depend upon the character of the deposit. If variable in form, hut fairly uniform in quality, the widths will need to he taken much more frequently than the samples. If the quality is variable the samples must be taken frequently. The width or length, area and weight which each sample represents should in every instance he stated. It is importaut, too, that the lines along which the samples are taken be shown on the plan. Ore deposits are frequently more or less handed, and, often, the values vary in the different hands. It is necessary therefore that, in such deposits, the samples be taken across the banding, and not lengthwise of it. If taken in the latter direction the latter may he wholly from a rich hand, or wholly from a poor one, and therefore, do not represent the average quality at that part of the deposit.

If these suggestions he followed we shall hear much less than in the past of errors in estimating ore in sight, for anyone can then check the calculations, and see at a glance what has heen observed and what assumed. Only hy willful misrepresentation could the facts then be concealed.

Some people, unfortunately, are incapahle of recording facts accurately, either from lack of the necessary training, or hecause their ohservations are more or less vitiated by all sorts of ideas that are not paralleled hy phenomena, so that what is becomes twisted into what, from their point of view, ought to he. Such men would he much more useful in the realms of fiction than in a mine.

Others, again, are more or less capahle of making the ohservations suggested, but from lack of ex-



perience in structural geology, are not, in some cases, capahle of forming a reliahle opinion as to the quantity of ore in sight. The work of such men could be checked if their reports were prepared as recommended.

The careless and reckless who might airily write down a few figures in the usual omnibus sentence as to the quantity of ore in sight—looking upon them prohahly as a mere matter of opinion—would douhtless feel themselves compelled to go into the matter thoroughly when the facts on which their opinion was hased had to he set forth clearly in the manner suggested.

It is also necessary that a statement should he made as to who is responsible for the different data employed, as for example: Who made the geological ohservations, who took the samples, who made the assays, who supplied the plans. The value to be attached to each part and to the whole can then he fixed with some degree of uses data supplied hy one less able or less careful, the conclusions of the former may be of very little value. In conclusion, the writer wishes it to he clearly understood that this communication is not so much intended to set forth all the methods and precautions needed in estimating ore in sight, many of which can only he determined on the spot, as to urge the importance of having all the observations of fact relied on to set out in the report and accompanying plan that anyone competent to do so may check the results. The effect of such a course will prohahly he to induce greater care on the part of those responsible for the estimates, and at the same time increase the confidence of those for whom the estimates are made hy affording a clear indication of what is meant hy "ore in sight" in each particular case.

Iron Smelting by Electricity.

In the valley of Camonica, in northern Italy, electric furnaces have heen erected for the purpose of manufacturing pig iron under the Stassano patent.

There are three furnaces, taking 500 H. P. each, used. In these furnaces electrodes are employed, placed in the lower part. The ore is pulverized hefore heing put in the furnaces and a sample carefully inspected and analyzed with the ohject of ascertaining how much carhon will be necessary to reduce it successfully, likewise the required quantity of fluxes.

After a determination of the lime, carhon and silicate, the proper proportions are added to the pulverized ore and hriquettes are formed, to which are added from 5% to 10% of coal tar. The furnace heat developed around the electric arc decomposes the iron ore, the oxygen with the carhon uniting to form carbon-dioxide. The figures given show that 3000 H. P. hours of the current, costing $3.42, are required to make one metric ton of iron.

Live Mining Exhibit at the St. Louis Exposition.

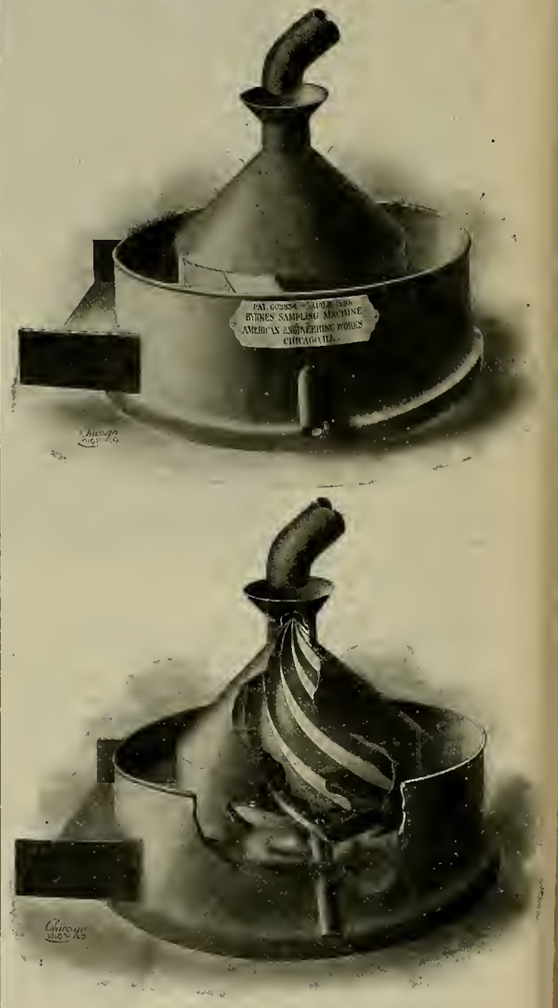
Representatives of the zinc and lead miners of Missouri have made inquiry of the chief officer of the mining and metallurgical department of the St. Louis World's Fair as to whether the erection of a zinc reduction mill would he accepted as an exhibit, the mill to he operated during the fair. The chief officer said, in reply: "That is just what the Louisiana Purchase Exposition wants you to do. There will he plenty of room for your zinc mill in the hig Mining and Metallurgy building. Make your exhibit as 'live' as you can, and don't worry about the space. Preparations are already in progress for the installation of stamp mills and smelters by the gold and silver mining men of Colorado, and the copper miners will have their machinery in operation in the same huilding. The mining exhibit at the World's Fair will be the largest and finest and liveliest ever assembled."

ELECTRICITY was first used for lighting purposes late in 1881 or early in 1882. Electric street lighting in Brooklyn, N. Y., hegan in 1884. The first city lighting hy electricity in the United States was in Cleveland, O., in 1879, the Brush arc lamps heing used.

Automatic Pulp Sampling Machine.

Every practical mill man knows that the practice of sampling hy a cup or dipperful of material is inaccurate. The sampling machine represented by the accompanying cuts is intended to be located in the system of launders or pipes in a mill so as to take the entire flow from the stamps or crushing machinery, or the entire flow of concentrates or tailings from tahles, vanners, etc., so that from the entire flow an absolutely average and definitely known part or sample may he taken.

Material is received in the hopper of the sampler onto the apex of an inside cone, the space between the inner and outer cones being divided into ten equal spiral chambers. When the material flows through these spiral chambers a rotary motion is developed. Nine of the spiral chambers discharge directly into the fixed casing, forming the hase of the sampler and through the free outlet of the casing can be led wherever desired. One of the spiral chambers is entirely closed and extends through the outer cone, terminating in a spout or chute which is open on the hottom. This spout or chute also discharges into the casing forming the base of the sampler, hut at every rotation of the douhle cone the spout passes



Automatic Pulp Sampling Machine.

over and discharges a certain amount of the material, heing sampled into a tuhe provided with a slot opening of known width. The width of this opening hears a known and definite relation to the circumference of the circle described hy the spout, thus a known portion or sample is caught and conducted hy the tuhe through the casing into any convenient receptacle placed outside of the sampler and under the outer end of the tuhe.

The operation of the machine appears simple and automatic. The makers say that one of these samplers has heen in constant and successful operation for the past two years in a well-known plant near Butte, Mont.

Five sizes of this machine are heing manufactured and carried in stock, varying in capacity from 25 to 600 gallons per minute. Other sizes can he made if desired. The standard machine is designed to cut out a sample exactly $\frac{1}{30\,0\,0}$ part of the entire amount of water and material flowing through the sampler. When required for use in cyanide or chemical work every part can he made of the material hest adapted to meet requirements.

This sampler was invented by Owen Byrnes, of Empire, Mont. The American Engineering Works of No. 204 Dearhorn St., Chicago, are the sole licensees, under the Byrnes patent, and will he pleased to furnish full information and quote prices to any one requiring this apparatus.

Mining and Metallurgical Patents.

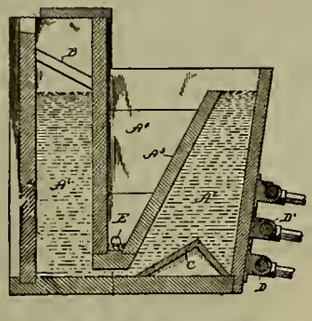
Patents Issued March 18, 1902.

Specially Prepared for the MINING AND SCIENTIFIC PRESS.

CHUCK FOR ROCK DRILLS.—No. 695,388; R. H. Hamill, Salmo, Canada.

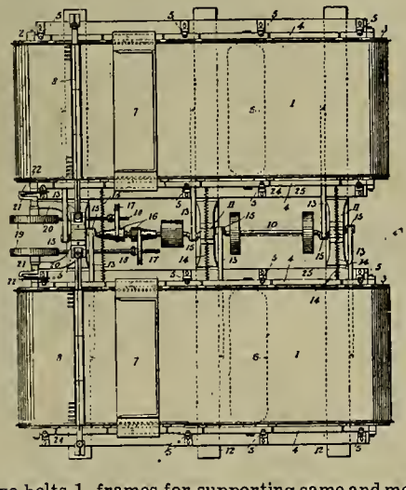
A head bored to receive a drill shank and formed with slot communicating with hore, in comhination with chuck key inserted in slot; hridge crossing slot and formed with dovetail groove in its under side; dovetailed key fitted into groove and wedge adapted to engage dovetailed key and chuck key.

ORE PULP DISTRIBUTER.—No. 695,654; F. W. Sherman, Park City, Utah.



Receptacle provided with pressure chamher having supply opening, sizing chamher connected therewith at or near its lower portion, and overflow chamher arranged to take care of overflow from sizing chamber and provided with discharge passage at or near its lower portion, screen in pressure chamher arranged adjacent to and underneath supply opening, inclined haffle hoard in sizing chamher arranged adjacent to connecting passage to hreak up eddy or current of pulp, and several multiple discharge valves connected with sizing chamher and arranged in different horizontal planes to take care of classified product and distrihute same uniformly through their several discharge openings.

ORE CONCENTRATING MACHINE.—No. 695,695; W. McDermott and F. E. Elmore, London, England.

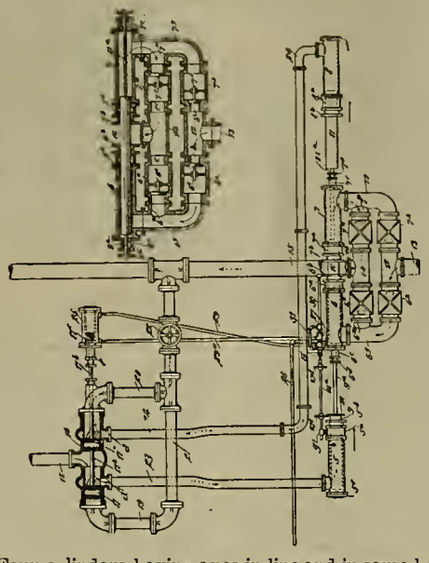


Two helts 1, frames for supporting same and means for causing helts to travel, common operating shaft 10, connecting rods 13 carried by frames, cranks carried hy shaft and acting on connecting rods for moving hoth frames in opposite directions, connecting rods engaging with cranks without caps wherehy thrusting motion only is imparted to them, springs 14 connected to frames for producing reverse movement of same, wherehy even motion without jar is ohtained, two cone pulleys 16 on shaft, driving roller 2 for each helt 1 and means connecting each cone pulley with roller so that two belts while driven from shaft 10 may he independently regulated with reference to speed of latter.

PROCESS OF PURIFYING ALUMINOUS ORES.—No. 695,762; D. A. Peniakoff, Brussels, Belgium.

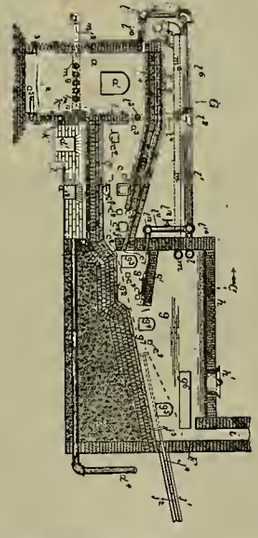
In the treatment of ferro-aluminous ores, such as hauxites, the process which consists in converting iron compounds therein into sulphides and then extracting iron sulphides thus formed with acid capable of attacking iron sulphide.

HYDRAULIC PUMP.—No. 695,815; C. B. Lakenan, Grass Valley, Cal.



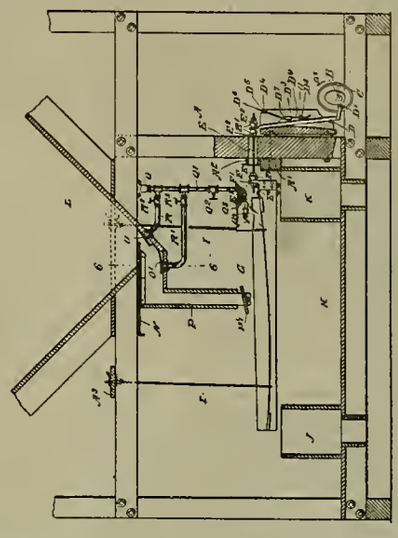
Four cylinders having axes in line and in same horizontal plane, outer cylinders spaced equal distance from adjacent ends of inner cylinders, which distance is less than the length of either cylinder and packing hox, and inner cylinders separated short distance at adjacent ends; packing boxes affixed upon ends of cylinders and exterior to cylinders wherehy interior packing is ohviated; three plungers axially in line, two occupying outermost cylinders and having length ahout equal to combined length of cylinder and exterior packing hox which it occupies, and intermediate plunger operating in two inner cylinders and having such proportionate length as will permit it to fully occupy one cylinder, and also pass through packing boxes on adjacent ends of inner cylinders; branch pipes leading from sides of inner cylinders and turned toward each other and axially coincident; valve hoxes secured upon hranch pipes and provided with valves; water inlet; pipe connection hetween hranch pipes and provided with valve hoxes; and discharge pipe leading from pipe connection.

REVERBERATORY SMELTING FURNACE.—No. 695,868; F. Nevegold, Portland, Or.



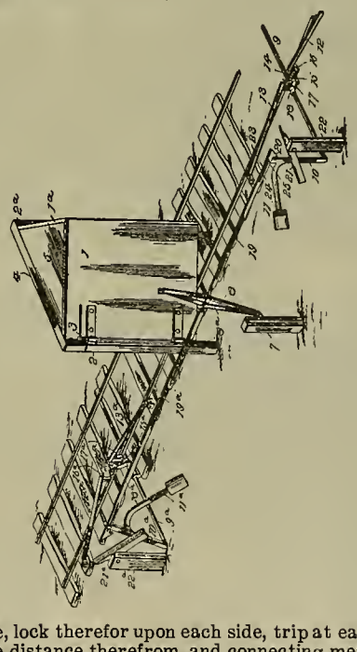
Fire chamher, smelting chamber, and intermediate concentrating chamher, smelting chamber heing on higher plane than concentrating chamher, inclined floor portion or roasting hearth, g^7 in smelting chamher; bridge wall h, separating fire chamher from concentrating chamber, reverberating roof over fire chamher and concentrating chamber, false roof extending over fire chamber, and for greater length of concentrating chamher, providing with reverherating roof intermediate heating chamber, discharging into forward end of concentrating chamber; means for producing hlast through base of fire chamber, and secondary blast through heating chamher; means for regulating hlasts relatively to each other; means for throwing continuous current of air or vapor under false roof, to protect same against heat, dividing wall f, between concentrating and smelting chamhers, having upper passageway, or flue c^7, and lower passageway, c^8, for fluid smelted material, upper passageway heing adapted to direct blast of volatile matter issuing out of concentrating chamber onto smelting hearth, and roof of lower passageway being low so as to skim melted material passing through passageway and hold back insufficiently fused matter, walls of concentrating chamher heing provided with slag taps arranged on level with lower passageway; arch g', projecting from wall f over smelting hearth for purpose of there concentrating heat; suitahly disposed doors in concentrating and smelting chambers for supplying fuel; means for injecting continuous current of air or vapors under arch g' to protect same; an auxiliary fire chamber d; and means for injecting blast therein.

COAL WASHER AND ORE CONCENTRATOR.—No. 695,790; A. C. Campbell, Asheville, N. C.



Pan and means for oscillating and imparting percussive action to it, pan having true bottom and false hottom, chamher heing hetween hottoms and increasing in depth toward discharge end and in direction in which percussion takes place, false hottom consisting of spaced riffles having perforated pockets at forward ends.

MINE GATE.—No. 695,858; N. K. Bowman, North Lawrence, Ohio.



Gate, lock therefor upon each side, trip at each side of gate distance therefrom, and connecting means hetween trips and gate, including bars mounted for longitudinal movement in opposite directions, parts heing combined, wherehy actuation of trip upon one side of gate by approach of a car effects opening of gate and sets lock upon opposite or far side of gate to hold latter open and whereby operation of remote trip effects release of lock and permits gate to close.

ELECTROLYTES are electrical conductors which are distinguished from ordinary conductors in three particulars. With a few exceptions their resistance decreases with increase of temperature, instead of conversely, as in the case with ordinary conductors; most electrolytes are liquid at ordinary temperature; and they are decomposed by the passage of a current. Perfectly pure water is not a conductor of electricity, nor is perfectly pure acid, but a solution of sulphuric acid in water is a conductor; and this is true of many other solutions of salts and acids in water. When an electrolyte is decomposed hy a current the molecules are separated, and some are liherated at one electrode and the others at the other electrode, as, for instance, the oxygen and hydrogen of water, which are liherated each at its own electrode.

MINING SUMMARY.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

KETCHIKAN.

It is understood that a sale of the Westcoatt properties at Niblack Anchorage, Prince of Wales Island, has been made to Eastern people, who will begin the work of development next month.

NOME.

In Boulder creek, in the Kuskokwim district, the pay streak has been located from the mouth to No. 5 above discovery, a distance of about 2 miles. In some places it is over 100 feet wide, and from 3 to 5 feet deep, averaging 15 cents to the pan.

Winter work on the Dexter benches at Nome has been carried on on three or four of the claims, fifty or sixty men being employed in taking out dumps. The benches opposite No. 5 and 7 were worked this winter, as well as Creek Claim No. 2 on the left fork and the fraction between Nos. 1 and 2. J. A. Dufresne, the owner of No. 10, expects to have a $30,000 dump by spring. With the building of the proposed ditches, Mr. Dufresne expects next summer to work the claim hy hydraulicking.

Private letters from Nome state that work during the early winter was progressing steadily on the benches of Anvil, Dexter, Cooper, Glacier and other creeks. The latest news from the Arctic district stated that good pay dirt had been found for 20 miles along Candle creek. The construction during the winter of a large water ditch to carry a strong head of water from the Nome river to the benches of Anvil and Dexter creeks had been started and it was expected to complete it early this summer. R. T. Chestnut writes that the country about Council City will become this year a great gold producing district. From Nos. 15 and 23 on Ophir creek C. D. Lane is said to have taken out over a ton of gold in 1901, and it is understood that Lane's representatives will employ 1000 men in his mining and industrial enterprises during the coming summer.

VALDEZ.

The Alaska Copper Co., H. O. Havemeyer of New York president, it is reported, has bought the McClelland copper mines, in the Chittyna district, at $1,100,000 for ten-elevenths of the forty-five claims, with 320 acres of coal land. W. R. Abercrombie and B. F. Millard own the remaining one-eleventh. Of the price, $2500 has been paid, $5000 is to be paid No. 1, 1903, and the remainder by Nov. 1, 1904. It is the idea in Alaska that the company will build a railroad to the property, so as to get copper and coal to tide water.

ARIZONA.

COCHISE COUNTY.

Under D. E. Heller the preliminary work for the construction of the reduction plant of the Calumet & Arizona Copper M. Co., at Douglas, is being rapidly accomplished. The company has a quarry from which stone for the foundations for the heavy machinery is being procured. A spur from the railroad has been built to the quarry.

GILA COUNTY.

The annual report of the Old Dominion M. Co., at Globe, for the year ended Dec. 31, shows:

Gross value of copper, silver and gold product		$1,276,979
Cost at mines and smelter	$993,800	
Freight, copper chgs., commissions, etc.	169,339	
		1,163,140
Profit from production.		$113,839
Special con. and imp. account		72,197
Surplus		$41,659
Balance on hand Jan. 1, 1901	$401,992	
Difference in price in stocks on hand, 2,300,000 pounds fine copper at 16⅝c (Dec. 31, 1900) and 12c (Dec. 31, 1901) 4⅜ cents	106,375	
		295,547
Balance of assets Dec. 1, 1901		$337,206
Cost per ton ore mined	$5.845	
Cost per ton ore smelted	4.798	
Cost per pound copper, exclud-in cons		.1153
Cost per pound construction		.0072
Total cost per pound		.1225
Average yield fine copper		6.23%

E. Smith and W. W. Swetland, of Los Angeles, have taken a year's bond, at $22,000, on two copper claims owned by N. S. Berray and C. Bartailleur on Middle Pinto creek, near Glope. Work is to be commenced before April 15.

Operations in the Gray shaft of the United Globe mines, at Globe, have been interrupted by an unexpected flood of water encountered at a depth of 780 feet, the water rising rapidly 200 feet deep in the shaft. Two No. 9 pumps have been submerged. The shaft will be unwatered by the use of tanks, using two of 700 gallons capacity.

In the Alice mine of the Troy group, at Troy, the crosscut from the 165-foot level has been driven through the lode, opening fine ore. In the Sisson shaft of the Manhattan sinking was resumed, and the shaft is now in a large body of iron, heavily copper stained. The third level drift from the Sisson shaft is in 12% sulphide ore.

MARICOPA COUNTY.

(Special Correspondence).—The outlook for the mining industry of central Arizona has never been more flattering than at present. The regions of Wickenburg and Congress are receiving a great deal of attention from prospectors. Work on the Leviathan Co.'s property near Octave is showing up well in a widening body of ore of the same character as that of the Congress and Octave mines. Southwest of Wickenburg Senators Dorsey, Pettigrew, Chandler, Teller and J. P. Jones are interested in a group of fifty claims called the Del Monte, on which considerable work is done in the way of development. An 80-stamp mill, concentrator and cyanide plant are being provided for this property and will be erected during the coming summer. The Angel group of copper mines is to have reduction works erected at an early day. At the Oro Grande, where less than a year ago the first strike of rich ore was made at the depth of 34 feet, Upton, Hatfield and Ellis of Wickenburg and G. E. Lamb of Iowa, the owners, have the shaft down 300 feet and about 1700 feet of drifts and crosscuts, all in ore, with only one wall of the ledge found. The workings cover a width of from 120 to 150 feet. It is announced by the owners that a 100-stamp mill is to be erected immediately and reduction of the ore begun. B. Hatfield, one of the original owners, has recently sold his one-sixth interest to his partners for $100,000. A three-compartment shaft will be dug as an upraise and will be ready before the mill can be erected.

Another property that looks most promising is that of the White M. Co., lying 6 miles from the Oro Grande. It is in an entirely different formation. The two ledges, well defined in their outcroppings, are about 10 feet wide, with pay streaks of from 2 to 4 feet. About 600 feet of work is done in short tunnels.

Phœnix, Arlz., March 23.

MOHAVE COUNTY.

Work on the Burro properties, near Kingman, will soon be started up. A mill is to be installed at once and operated by water power from Burro creek. A site for power development has been located, and the transmission line will be less than two miles long.

S. C. Bagg, Supt. of the New Comstock M. Co., near Kingman, is arranging for a supply of coal at the mill on the Colorado river. Large ore bins are under construction, and a tunnel is being driven in to open the ore body at a depth for stoping.

PINAL COUNTY.

The Mineral Hill M. Co. has been incorporated in Phœnix with capital $1,000,000. J. W. Cope, A. S. Arthur, M. T. Russell, C. M. Sturges, B. F. McFall and E. S. Russell are the directors. The company's mines are located in Pinal county, and are said to be rich in silver. Considerable work has been done on the property.

SANTA CRUZ COUNTY.

The Independence is the discovery claim at the new gold find near Patagonia. It is owned by R. R. Richardson, W. Powers and J. B. Seager. About fifty claims have been taken up. J. Parks has the old Gringo mine, which is close up to the side line of the Independence. There are a number of claims which have been located upon which work is being done. On account of the richness of the ore taken from the Independence, the shaft has to be guarded. It is estimated that more than $1000 in value was stolen in one night and carried away. There is a good road into the camp, also abundance of water in the gulch, along which tents are being pitched and camp established.

YAVAPAI COUNTY.

The Gopher mines, near McCabe, have been hought hy the McCabe Extension Co.

The Big Rebel G. M. Co. has been incorporated, with Mrs. M. K. Church as president and J. H. Hise of Prescott vice-president and general manager, to take over and operate the Red Buck and other claims near Kirkland. A stamp mill will be erected.

F. Williams has sold the Storm Cloud group of mines near Prescott to Chicago people, who propose to go right to work sinking. The payments run through a period of fourteen months. The purchase price is said to be $40,000.

S. E. Bretherton, metallurgist at the Val Verde smelter at Val Verde, gives the following as the composition of the charges, 100 of which are fed into the furnace during twenty-four hours:

	Pounds.
Sulphides	960
Copper containing lime	240
Slag containing small per cent values	500
Coke	55
Total charge	1755

Thus it will be seen that the first two items of ore amount to 1200 pounds to the charge, or sixty tons every twenty-four hours, and with the adding of the slag makes eighty-five tons, leaving two and three-quarters tons as the small amount of coke used. This is the work the furnace is now doing, and on the basis above given twelve tons of ore are being concentrated into one ton of matte. The ore which has been run so far carries from 7% to 11% arsenic and a great deal of sulphur. Of the former, all is extracted from the ore and very nearly all of the latter, making a very excellent quality of matte.

Supt. Mansfield of the Empire Co. and Groom Creek G. M. Co., at Groom Creek, has installed a pump in the Alma mine shaft, which is making more water all the time. The vein of ore, 18 inches wide at the surface, is 4 feet wide down 135 feet. The shaft will be put down 200 feet and drifts run each way on the vein.

CALIFORNIA.

AMADOR COUNTY.

The Sargent quartz mine at Middle Bar has been bonded by W. B. Thomas, Supt. of the Central Eureka mine at Sutter Creek, for four years at $30,000, $50 a month to be paid. Operations will be commenced at once.

The Central Hill gravel mine has been bought by Nuner Bros. of San Andreas and the old bedrock tunnel has been cleaned out and retimbered.

In the Bootjack mine at Plymouth a 4-foot ledge is claimed in the 100-foot deep shaft. A crushing of 100 tons of ore is to be made and is expected to go $7 or $8 to the ton.

CALAVERAS COUNTY.

The Junction placer mine at Douglas Flat, near Murphys, is being developed by Williams, Roberts & Co., who are sinking a shaft to reach the bedrock of the channel.

At the Fanny Marie mine at Glencoe, in the 200 and 300-foot levels the ore prospects well. At the Bluejay, near Jesus Maria, another property of the company, a tunnel has been stated to tap the vein 800 feet down. The ledge in the shaft on the surface is about 5 feet in width.

A strike has been made in the Mountain View mine, owned by Woodcock Bros., at Glencoe. A shaft has been sunk 120 feet. The 100-foot level shows a vein 5 feet wide, with free milling ore.

The mine in Hazel Dell gulch, near West Point, being operated by Newsome, Sterling & Congdon, is on a ledge 10 inches wide, but the ore is claimed to be extremely rich.

C. M. Burleson, who has bonded the Petticoat mine at Railroad Flat, has started development and has given a contract for 1000 cords of wood to be cut by the first of May.

A strike is reported made in the Sheep Ranch gold mine at Sheep Ranch. A crosscut run from the 1300-foot level to the ledge is stated to have struck the downward extension of the ore shoot 6 feet wide. J. T. Langford is Supt.

The Werle gravel mine, near Chile gulch and about 2 miles from Mokelumne Hill, is working its 3-stamp mill. Considerable dead work has been done during the winter in sinking, opening pay gravel.

J. J. Meyers of San Francisco has been examining the Black Oak mine, at Angels, which has not been worked for four years on account of water. At the present time there is a 90-foot shaft, which is to be sunk to 600 feet. The owners will put up either an electric or steam hoist. The company is composed of New York and Chicago people. F. McMillen of San Francisco is consulting engineer for the company.

The owners of the Angels quartz mine, at Angels, have bought the 20-stamp mill and air compressor now at the California Ophir mine and will remove it to the Angels mine and erect it in conjunction with forty other stamps.

The Salvator G. M. Co. is building a wagon road to its mine, near Mokelumne Hill, preparatory to hauling in the machinery for a 10-stamp mill. It is also making a ditch from Esperanza creek to its mill site.

Water from the Stanislaus dam was turned into the flume line of the Melones mine at Melones on the 19th, completing work of six years of preparation under the supervision of Wm. C. Ralston, general manager. Ore was started through the mill on the 22d.

DEL NORTE COUNTY.

E. A. Work and J. Bagley, of Crescent City, are interested in the Cant Hook Platinum & G. M. Co. Locations have been made of the bars along the South Fork of Smith river, for a distance of 4 miles. All the bars are claimed to prospect well in platinum and osmium. Preparations are being made to work the ground, which is expected to pay several ounces a day for each man shoveling into sluice boxes.——J. Holloway, who is mining on Smith river, it is said, has about forty pounds of platinum concentrates gathered from his gold mining operations this winter.

INYO COUNTY.

The southern gateway of Death valley has been opened, according to a letter received by Prof. Bailey of the State Mining Bureau. Prof. Bailey lately went through Death valley, especially investigating the salt and niter deposits that are of enormous extent. The letter tells of the opening and acceptance of a stretch of railroad several miles long, reaching from Manvel on the Santa Fe railroad lines over the summit of the mountains, from whence there is a somewhat easy passage into the valley for pack trains and wagons. The new line is the California Eastern. In addition to furnishing an entrance into Death valley this road also is supplying means to reach the Tonopah mines, and also the Searchlight mining district in southern Nevada. The line does not enter Death valley, but reaches a point from which it is comparatively an easy journey into it.

The Soda Works Co., at Keeler, is making preparation for the construction of sixty acres more of vats. The company has about 100 acres in use at present.

MONTEREY COUNTY.

The Ralston G. M. Co. is engaged in the first placer mining to be attempted in Monterey county. The property consists of forty-three claims, covering 860 acres, located near Mansfield, about 2½ miles from the coast. The output for the year ending December 10, 1901, was $8000 in nuggets. The report of the assay of the black sand shows that it goes $102.80 to the ton. Gold runs $17.25 to the ounce.

NEVADA COUNTY.

G. A. Nihell and G. Gray of Grass Valley have taken a contract to erect a building to hold a 5-stamp mill at the Niagara mine, in Willow valley, near Nevada City.

J. Clark has sold part of the Oro Fino mine, near Nevada City, to Capt. Ord of Benicia and associates.

R. Phelan & Co., owning the Gold Ridge mines, lying between Graniteville and Meadow Lake, have sold out to a San Francisco company, represented by M. M. Baruh, formerly of Nevada City. The latter is arranging for extensive operations as soon as the snow melts.

Dr. Fouch of North San Juan has completed arrangements for resuming work at the Ensign mine, between Sweetland and Birchville. A mill was erected on the property last fall and in a few weeks it will commence crushing ore.

The New Mohawk mine near Graniteville is to be operated by C. Schuenert of Sacramento, W. McLean of Graniteville and associates. Mr. McLean will have charge of the work.

The Providence G. M. Co. has sold and turned over the Providence mine and other properties at Nevada City to the Champion G. M. Co., it is reported, for $130,000. The Champion Co. now has the Champion, Merrifield, Wyoming, Nevada City, Spanish, Providence and Ural mines, giving a continuous string of mines for 3 miles on a rich lode. The Champion Co., with E. R. Abadie Supt., will work the Providence mine through drifts from the Champion mine. The Champion mill has seventy stamps and the Providence forty. The Providence mine was located in 1858 and has produced over $6,000,000 to date. The lode has been worked for over a mile and to a depth of nearly 2000 feet.

The Spenceville Mineral Co., C. W. Howard, Jr., manager, will begin operation again by the first of May. The company is to prospect the property by a diamond drill.

H. W. Morris, W. C. Peyton and J. P. Wallace, owners of the Yuba mine at Maybert, state that work will he immediately resumed at the Yuba under Mr. Morris as Supt. Only the pumps have been kept running for several months past.

PLACER COUNTY.

W. Duffy, Supt. of the Sailor gravel mine, near Westville, reports that he has

cut into well-washed blue channel gravel that prospects $4 per car.

PLUMAS COUNTY.

J. Gill and C. Penman have been prospecting a gold-bearing quartz vein near Quincy, and report the ledge to be from 10 to 25 feet wide and traceable for a distance of 3000 feet.

The mill at the Puscheck quartz mine on Bear river, 4 miles northwest of Colfax, has been started up.

SAN BERNARDINO COUNTY.

(Special Correspondence).—The Grand Central group of mines in Monumental mining district, 50 miles below the Needles, 37 miles below Mellen, the nearest railroad station, 12 miles from county wagon road at West Wells, and near the old Rincon steamboat landing on the Colorado river. The formation of the district is chiefly granite and porphyry. The six claims carry a small per cent of copper and one of them sulphide of iron. Considerable development work has been done by shaft, tunnel and open cut. Two years ago ore was shipped from three of the claims to Pueblo, Colo., towed up the river by Indians in small boats to Mellen. The returns are not at hand and cannot now be accurately stated, but at the time were considered extremely good. The mill site is on the river bank adjoining the mines.

South of this range, 9 miles from the Colorado river, is Copper basin, where E. D. Bannister of San Francisco and Mr. Leiter of Chicago were interested. It is said to be a very rich and extensive copper district. A mile above Rincon landing Los Angeles men have taken up all the gravel ground available for dredging purposes, and are said to be making preparations to start in on a large scale.

Yuma, March 16.

A letter from the Dale mining district states that developments indicate that the richer rock is at some depth below the surface. All the good rock milled from the O. K. mine, it is stated, came from below the 150-foot level. At 250 feet they have a large body of ore that mills over $40 per ton, while nearer the surface it milled less than $15. The Eaton mine ore on top assayed $3 and at a depth of about 100 feet some ore assayed up into the hundreds of dollars. Not enough development work has been done on any one mine to tell just what there is in the camp, but there are good prospects.

SHASTA COUNTY.

The Northern Light mine, near Shasta, is reported bonded by F. E. Ware of the Mount Shasta Mines Co.

The new mill of the Mount Shasta mine on Clear creek, near Shasta, has been completed and started crushing.

J. R. DeLamar of the Bully Hill copper mine and smelter is reported to be considering the doubling of his smelter to keep up with the new copper discoveries of the mine.

The Shasta G. & C. M, Co. has been incorporated in Salt Lake City, Utah, capital $300,000, with W. F. Mitchell president and G. C. Snyder secretary and treasurer. The company owns the De Dallas, Gossin King, Gossin Queen, Nut Pine, Sulphide, New York, High Ore and Queen Draga mining claims in the Pittsburg mining district.

In the Evening Star mine of Old Diggings, near Whitehouse, a crosscut tunnel has struck a ledge 800 feet in which prospects well. This ledge is paralleling the Evening Star vein, distant from it about 200 feet, and shows a width of about 8 inches.

SIERRA COUNTY.

At the Feather Fork Co.'s property, commonly described as the Thistle Shaft, the Bellevue tunnel is now in nearly 2000 feet, and in softer rock. It is going ahead at the rate of about 70 feet a week. There are about thirty men now employed.

The Wide Awake G. M. Co., of which F. H. Wheelan of San Francisco is president, J. L. Field of Alameda secretary, and W. H. Rouse of Oakland Supt., bought some years since an extensive placer claim near Downieville. The superintendent reports after seventeen months work that from tunnel No. 3, in an upraise of 45 feet, the old channel of auriferous gravel has been struck.

After prospecting for three years and a half the owners of the White Bear group of mines at Port Wine, A. S. Macdonald of Oakland, A. N. Lewis of San Francisco and associates have struck the old Port Wine channel formerly worked in the Monte Cristo mine adjoining.

SISKIYOU COUNTY.

The Clark hydraulic mine on the upper Greenhorn creek, owned by Martin, Hawkins & Co. of Yreka, has been bonded at $7000 to Colorado people, who intend reopening it. It has been shut down for over twenty years on account of litigation.

Extensive repairs and alterations have been made at the Dewey mine, near Gazelle. New concentrators and a canvas plant are included in the improvements. In addition a sawmill is to be erected at the mine in order to enable the company to cut its own timber and lumber.

TRINITY COUNTY.

A payment of $14,000 has been made on account for the Fairview mine, at Minersville, and the balance of the bonding price ($60,000) is to be made on June 1. C. Allenberg is one of the new owners and J. Porter is Supt. Two tunnels have been driven. No. 1 is in over 200 feet and 240 feet below the apex; No. 2 has been driven in 540 feet. The ledge is in slate and shows in a width of from 6 to 10 feet $8 to $10 a ton free-milling ore. A 10-stamp mill will be erected during the early summer.

C. Swoeny and wife of Spokane, Wash., have deeded to the Trinity County G. M. Co. the Chloride-Bailey group of mines on Canyon creek, at Dedrick.

TUOLUMNE COUNTY.

It is reported that a large and rich strike has been made in the Jumper mine, near Stent, a pocket of almost pure gold. It is claimed that almost $1,000,000 has been taken out or is in sight. The Jumper has a vein of free-milling ore in which, as work progresses every few months a pocket is uncovered. Two or three of the large ones have been taken out before, but this one just found, it is claimed, exceeds anything of the kind ever reported. The Jumper is owned by an English and Scotch syndicate.

L. M. Cody and C. A. Bigelow are reported to have struck a good pocket claim on the Hebbing ranch, near Tuolumne.

Ten stamps are to be added to the Republican mill at Jacksonville.

The Wild Cat and Joe Hooker mines at Sonora have started up. E. A. DeHaven is Supt.

A. Colby and H. M. Pease have struck a rich pocket in their claim on the Fleming vein, near Algerine.

The Golden West mine near Sonora is now running with full force, and the mill has been started up. On the 300-foot level there is said to be 20 feet of solid pay ore. There is a strong flow of water.

Single-handed machine drills are in use in the Soulsby mine at Soulsbyville. About 30 men are employed. The ore stoped is keeping the 10-stamp mill running one-half time.

Arrangements are being made by the Gold Ridge M. & M. Co. for the erection of a 10-stamp mill on the Gold Ridge group of six claims near Quartz. Developments made indicate a large deposit of fine milling ore. W. Jones is president, and A. Jones secretary of the company.

The Wheal Perrin mine, a parallel vein on the west of the Soulsby, at Soulsbyville, is being unwatered, and a steam plant is being installed.

At the Badger mine, near Jamestown, the shaft is down 250 feet, showing a 4-foot vein of good ore in the bottom. G. E. Stayton is Supt.

A 40 H. P. engine has been installed at the Potato Ranch mine, near Phœnix Lake, near Carter's. The shaft will be cleared of water and mining resumed.

The McAlpine quartz mine and mill site, near Big Oak Flat, have been bonded to S. E. Rigg. An incorporation is to be made and S. E. Rigg is to be Supt. Work is expected to commence before May 1st.

The Mohican M. & M. Co. has been incorporated, with office at San Francisco, to operate the Mohican mine. H. C. Chesebrough, G. W. Fisher, H. Fisher of Oakland, S. Holmes, W. Classen, C. E. Holmes, and E. Holmes of San Francisco are the directors.

M. C. Duchow has leased a portion of the Empire gravel mine and her half interest in the Bed Rock blue gravel mine, on Table mountain, near Sonora, to L. Lang, R. Lang and Duchow Bros. for five years. The lessees have commenced operations.

A rich pay shoot has been uncovered in the Dead Horse mine, at Carters. The Dead Horse was formerly owned by Hobart & Hayward and has been a gold producer for many years. It is the deepest worked mine on the east belt.

VENTURA COUNTY.

(Special Correspondence).—A group of mica claims in Piru mining district, Ventura county, promises well. The mica is of the muscovite or white variety, the formation granite foot wall, with hanging wall mica schist, the mica coming up between the granite and the mica schist and forming in the feldspar. A company has been formed and men are now at work under the direction of H. Mead. A camp has been established and a wagon road constructed, enabling transport of material from the highest claim, 6000 feet above sea level, to the lower camp, where a mill is being erected. Of the eleven claims now owned by the company three have been stripped—the Alamo for 150 feet, the Slopa 100 feet and the Gertrude runs for half a mile, extending into the Alta—all in varying widths, from 4 feet to 400 feet. Where the claims have been opened the mica shows in mass, with quantities of book mica.

Bakersfield, March 26.

COLORADO.

BOULDER COUNTY.

About 18 inches of high-grade gold ore has been opened up in the 70-foot level of the Gold Crystal mine at Ward.

A company is being formed to prospect the Red Jacket vein or ledge near Ward. This ledge of mineralized material is from 100 to 300 feet in width, and bears low-grade payable values at different points on the surface.

The New Morning Star M. Co. has been incorporated in Wyoming to operate at Ward, with capital $100,000. C. J. Pratt is president, D. W. Dwight secretary and treasurer, both of Boston, Mass. J. E. Lee of Boulder is Supt. at Ward.

The B. & M. mine, near Ward, is shipping a fine grade of smelting ore and accumulating mill ore on the dump. The mine is to have a mill to save an expensive haul.

CHAFFEE COUNTY.

The Silvertip G. M. & M. Co. has ten claims near Salida, which it will develop during the summer. A shaft is now being sunk and machinery will be put on at once to sink 500 feet. S. Hopkins is president, G. P. Nix secretary, and E. Beeler manager, respectively, of the company.

CLEAR CREEK COUNTY.

(Special Correspondence).—The plant of the Idaho Springs M. & R. Co., of which A. H. Roller is manager, is built in two sections. The first has 30 stamps, with an amalgamating plant following each battery, the material passing from the plates to Bartlett and Standard tables. The middlings from the Bartletts are returned to the Bartlett belt-slimer. At present about 60 tons per day are being run. The saving on the plates is an important item in treating the ores handled. The other section, the equipment for which is not yet in place, will have three crushers, six sets rolls, Colorado Iron Works shaking screens, and several Bartlett and Standard tables. This section will be strictly for concentrating work. The mill will do custom work, having now some good contracts with large producing mines.

The Seaton Mountain M. Co., F. S. Goldsmith, manager, is producing 500 tons of ore a month, the bulk of which is milled. Their work is mainly through the Foxhall tunnel, belonging to the Alma Co. From the highest surface workings to the bottom of shaft, that sinks from the tunnel level, is 900 feet. The underground work aggregates about a mile.

The Mixsell mill, sold to R. Reed, of Seattle, Wash., is being operated by the new management.

The Alma G. M. Co., owners of a group adjoining that of the Seaton Mountain Co., is in charge of manager J. J. May. The Foxhall tunnel, 1350 feet long, runs through Alma ground. A small tonnage of ore is being shipped, which is high grade. A gasoline hoister will be put in to sink from a point in the tunnel.

The Newhouse tunnel, now in 13,000 feet, is being driven ahead at the usual rate of speed. The haulage over the double track of this tunnel is now done by an electric locomotive, which is capable of hauling 70 tons. About 1000 tons of ore per month are being shipped out of this tunnel by mine owners who have mine connections made with it. Manager Hanchett states that thus far about 3000 feet per year have been driven, and that at this rate it will require two years and four months more to complete the tunnel.

The Little Mattie M. & M. Co., managed by W. S. Leebreck, has a group formed formed from the consolidation of the Mattie, Republican, Silver Glance and Newton. The property includes a mill which is being overhauled preparatory to operate. It will include crushers, rolls, screens, jigs, stamps, hydraulic classifiers and settlers, and concentrating tables.

The Consolidated Alpine G. & S. M. Co., one mile southeast of the Lamartine, was formerly a producer, and is now being put in condition to operate by the new manager, T. B. Crow.

As an indication of the activity and interest in Clear Creek county, it may be stated that for the year 1901 there were 380 patent surveys ordered by the Surveyor-General.

Idaho Springs, March 19.

The owners of the Cumberland and Independence group, at Yankee, have given an option to the Yankee Con. M. & T. Co. The mine is developed by the Cumberland shaft, 115 feet deep, in which there is over 4 feet of eight-ounce ore. A small 5-stamp mill at the shaft has made the mine pay its own way with a profit from milling from three to four tons per day of ore.

The Golden Hecla M. & M. Co. has been incorporated, capital $250,000, by J. W. Boyd, R. C. Quick and W. A. Haggott, to operate the Silver Horn tunnel, near Idaho Springs.

The Elgin M. & R. Co., of Chicago, Ill., has been incorporated to operate in Clear Creek county, by M. Green, J. Van Liew, and J. Stoddard, all of Chicago.

A party of Eastern people have been inspecting the Vulcan mine at Silver Plume, and it is reported that a new company will take over this property and resume work at once. It is believed that a large body of ore exists in the junction of some of the lodes of this group, but 200 feet of a tunnel will have to be driven to cut them.

E. H. Worrell, Jr., of the New Era M. Co., at Freoland, has made arrangements to start up extensive operations in a few weeks.

The Star tunnel, near Idaho Springs, is to be started up and driven to the Little Mattie mine to open it below the shaft. Air drills will be used in the work. The tunnel is now in about 1400 feet.

The Double Header mine, owned by H. L. Roberts, with H. H. Noyes manager, has been bought by G. Albertson of Denver, representing an Eastern company, for $5000. The group consists of several claims on McClennan mountain at Silver Plume. The new company will commence operations at once.

GILPIN COUNTY.

The Ivanhoe mine, near Nevadaville, has been started up with W. Grenfell as foreman. The retimbering of the shaft is being done. This property is owned by St. Louis, Mo., people. The mine yields smelting ores carrying a heavy percentage of lead and zinc, the average values being between $40 and $50 per ton.

Denver people have taken a lease and bond on the Little Jemima property at Gregory, owned by W. Benallack, Jr. and associates of Central City. The mine is developed by a shaft now 80 feet deep and a tunnel. The lessees are figuring on putting up a gasoline plant.

LAKE COUNTY.

About 2000 tons daily is the heavy oxidized iron output of Leadville. The Resurrection, Ibex, New Monarch, A. M. W., Evelyn, White Cap and others are still unable to dispose of sulphide ores.

The work at Lake Park by the Hap Hazzard Co. is developing large bodies of low-grade free milling ore. It will be necessary to have mills at the mines for their treatment. The ore is a honeycombed quartz material carrying free gold.

LARIMER COUNTY.

The tunnel of the Empire copper mine, near Fort Collins, is reported to be in shipping ore. The stockholders' meeting has decided to erect reduction works. S. Stark is manager.

OURAY COUNTY.

Plans are now perfected for the building of a large mill for the Camp Bird Extension mine at Ouray, the work to be commenced in June.

O. C. Van Houten and J. Z. Prosser have sold to L. B. Jackson and associates of Chicago the Tempest group of three claims, situated in Imogene basin, near Ouray and adjoining the Camp Bird. The price was $42,000. Mr. Jackson and associates now own seven claims and it is said will begin the erection of a mill soon and equip the mine with electric drills and other machinery.

The Gennessee-Vanderbilt group at Red Mountain, consisting of five claims, has been sold to a New York company for $25,000. The property was a big producer of silver prior to 1893, when it was closed down. It is developed by two shafts and two tunnels. The new company contemplates doing considerable development work.

ROUTT COUNTY.

The Hahn's Peak & Elk River Canal & Placer M. Co., owning the placers at Hahn's Peak, near Steamboat Springs, is installing several thousand feet of piping for hydraulic works. Later in the season a dredger will be installed for operation next year.

T. Emerson and J. Labr are driving a tunnel on the Iron Springs divide, near Craig, in search of a vein or the source of the placer gold which is very abundant in that locality. The tunnel is in rich gravel and follows the bedrock.

SAGUACHE COUNTY.

The new machinery on the Independent mine, near Crestone, has drained the mine and the shaft is being pushed down with power drills. Some ore is being shipped direct to the smelter and the low-grade ore is put through the mill.

At the San Isabel mine at Crestone a steam hoist is being installed and the shaft will be sunk to a depth of 500 feet. L. N. Fitts is manager.

The 5-stamp mill installed at Liberty by the Blanca Mutual M. & M. Co. has been started up. E. S. Ainutt is Supt.

SAN JUAN COUNTY.

The Hidden Treasure group of five

claims, located in Mastodon gulch, near Silverton, has been sold to Colorado Springs people for $400,000, part cash down. The property formerly belonged to R. Hanson.

SAN MIGUEL COUNTY.

The Nevada vein at Ophir has been cut by the Deadwood tunnel at a depth of 940 feet from the surface. Assays where the vein has been intersected show values at from $15 to $20 a ton in gold and silver, principally the former. The tunnel will be extended to cut other veins owned by the company, and drifting and blocking out the ore will commence April 1. Should the character of the ore be the same as at the point of intersection a mill will be built. G. R. Dolf, formerly Supt. of the Suffolk-Globe M. Co. at Ophir, is manager of the company.

SUMMIT COUNTY.

In the Etigrade mine on Little mountain, near Breckinridge, owned by R. W. Foote and J. Conrad, a paying body of silver-lead ore carrying gold has been struck. The strike has been made in a 50-foot drift from the bottom of a 130-foot shaft in the Etigrade vein here ranging from 2 to 6 feet in width, with a pay streak averaging a foot in thickness, which will mill about $70 per ton.

The Puzzle M. & Red. Co. is renovating and overhauling the Engle mill in Georgetown, which it recently bought. A contract has been let for transporting several thousand tons of ore from the Puzzle Extension mine to the mill. H. B. Achter, president of the company, is personally superintending the work.

TELLER COUNTY.

(Special Correspondence).—In many respects Cripple Creek district is not so lively in a business way as it was, for instance, two and three years ago, although there is now fully as large a tonnage of ore being produced in the district as at any time in the camp's history. This is easily explained by saying that much of the former activity and business resulted from the employment of many men and much money in building the numerous towns, building railways, both steam and electric, all over the district, developing the mines and equipping them with power plants and other operating facilities. This work was in a large measure a preparation for the actual mining operations and ore transportation now carried on systematically and on a large scale. But the towns—consisting of Cripple Creek, Victor, Anaconda, Goldfield, Independence, Elkton, Altman and Cameron—have been built and their growth in the future will be by the slower processes that characterize a settled community. The railroad lines, which enter the district from the north, south and east, cover the camp with a network of trackage and afford facilities for passenger and ore transportation which are certainly unequaled in any other mining district in the world. But this work is virtually complete. The force necessary to construct these lines is no longer required.

Through the system of consolidation constantly in progress the tendency has been to reduce the holdings of the district to a number of large groups, each one operating as nearly as possible through one or two main shafts, equipped with modern facilities for hoisting and for power drill work. Many such shafts have been sunk and equipped. While some of these are being sunk deeper, some new ones are being started, and considerable new machinery has been and will be ordered for the future, it may well be observed that the mines of the district are well developed and well equipped. While development and exploitation will continue to go on, such work will be coincident to the principal business of actual mineral production. In the earlier operations of the camp the production was deemed incidental to the extensive development which demonstrated the extent and character of the ore bodies. The mines are now sufficiently opened to partially reverse this order. Hence, the force now required in Cripple Creek district is confined largely to operating the well proved mines or their extensions. The principal business is that of breaking down the ore, hoisting and sampling, and shipping to reduction plants. Power drills are more generally used now than formerly and the consolidations have reduced the number of hoisting plants. Other advantages have been taken which effect economy of operating.

The camp has not developed into a milling center. A number of mills have been erected in the district, of which only one—the Economic—is operating. With excellent ore hauling facilities to valley points, the great reduction plants for district ores have been built at Colorado City and Florence, where coal and fuel oil are both close at hand. Besides the cyanide and chlorination plants at the two points named there is the Rocky Mountain smelter at Florence, which is equipped for general work. The plant of the U. S. Smelting Co. at Canyon City, which has been confined to zinc-lead ores, will doubtless soon have facilities also for smelting such ores as are produced at Cripple Creek.

At present there are a larger number of leases in force than there has been for two years, and it is believed the number will increase. The Woods Investment Co., who control large holdings through various sub-companies, have given numerous leases.

The Independence Con. mine, at southwest foot of Bull hill, is under lease to R. P. Russell, who struck good ore on the lower levels in sinking the shaft to the 1000-foot level. Russell is shipping a considerable tonnage from this and other leases.

The Mary McKinney has given three leases on its upper levels and is sinking the main shaft 100 feet deeper.

The Vindicator keeps up a steady shipment of about 2000 tons of ore per month.

Lessee Kirk, on the Lexington, ships thirty to forty tons ore per day and is said to have recently struck 16 feet of two-ounce ore in a new shoot. This is on Gold hill.

The Economic mill, which handles most of the ore from the mines in control of the Woods people, is said to have made a profit of $25,000 for the past year.

About 150 tons a day are being shipped from Stratton's group through his Logan, Deerhorn, Orpha May and Abe Lincoln shafts. His Longfellow shaft on Bull hill is being sunk deeper.

The El Paso, on Beacon hill, for the year ending Feb. 10, 1902, sold 5847 tons of ore, the average value of which was $52.57 per ton, making $307,443. The operating expenses were $115,976; ore treatment and transportation charges, $60,006; paid lessees, $69,973; improvements, tools and implements, $10,211; dividends, $24,250; other expenditures, $10,873; cash on hand, $27,116. Supt. W. M. Bainbridge's report shows 5250 feet of development done on the El Paso for the year. WASCOTT.

Cripple Creek, March 15.

Manager G. Keener of the Mary McKinney mine at Cripple Creek states that an entirely new vein has been cut in sinking the main shaft below the fifth level. The mine is making about 400 gallons of water a minute, which is being easily taken care of by the pumps.

IDAHO.

ADA COUNTY.

T. Antisell of Salt Lake City, Utah, has sold to D. H. Moseley of Boise, for $1000, the Summit mine, near Shaw.

BOISE COUNTY.

The Lucky Boy shaft, at Idaho City, is down 160 feet and 30 feet below the level of the lower tunnel, in ledge matter carrying gold. Whether this is the Lucky Boy ledge or a parallel vein is not known. The mill is running on ore from the tunnel.

The Gold Hill mine, near Quartzburg, has been pumped out and sinking the shaft toward a depth of 1000 feet commenced.

CUSTER COUNTY.

A strike has been made in the Riverview mine, at Bayhorse, owned by O. J. Salisbury of Salt Lake City, Utah. A body of lead-silver ore 20 feet across has been opened up.

IDAHO COUNTY.

The Fanburg group of fifteen claims, at Thunder Mountain, has been bonded to a company represented by W. B. Moore of Walla Walla, Wash. The figure of the bond is said to be $100,000, and it is understood that $5000 has been paid down. The sellers of the property are three Payette men and W. L. Root of Warren.

The Poorman group of four claims, at Thunder Mountain, has been sold to L. P. Grunbaum of Boise City for $4000.

The Hunch M. & M. Co. has been incorporated at Moscow by R. M. Walker of Kendrick, G. A. Ruhedew of Collins, G. G. Pickett of Moscow, M. A. Ellis and J. A. Morrow of Pierce City. The company owns a group of claims at Pierce City and is preparing to work ore in a custom mill.

Spokane, Wash., people have organized a company to operate the Rice mining claim, near the Dewey mine, in the Thunder Mountain district. It is incorporated as the Thunder Mountain G. F. M. Co. The directors are D. Shoudy, W. Huntley, G. Ambs, C. T. Newcomb and J. R. Stone. Arrangements are being made to develop the claim as soon as supplies can be taken into the camp.

The Golden Rule M. Co., Ltd., has been incorporated by W. D. Rowland, E. Rowland, W. C. Lauder, G. N. Larrabee and A. C. Larrabee; capital, $100,000. The company owns the Rowland Bros. group of claims on Moscow mountain. A ledge of gold-bearing quartz has been exposed in a number of places.

J. H. Morris of the Big Creek M. & D. Co. at Dixie says that in and about Dixie there has been considerable activity during the winter. The Gold Bug and Columbia have just had the contract for 100 feet of sinking and 150 feet of drifting completed. The mill on the Dixie Queen, a property controlled by W. H. Plummer of Spokane and the Hye Bros., is to start up as soon as the spring thaw comes. A 4-stamp mill is being put on the North Star. On Crooked river a 10-stamp mill is being erected on the Hogan property.

The Sunnyside property at Thunder mountain is reported sold by the Caswell Bros. to the Belle of Thunder Mountain Co. of Pittsburg, Pa., for $125,000. The terms of the sale are said to be $50,000 down and the remainder upon examination and approval of the title.

KOOTENAI COUNTY.

At the Buckhorn group, near Bonners Ferry, a stamp mill will be built under the direction of E. Doust. The Hoosier Boy G. M. Co. of Granite, Or., owns the mine.

OWYHEE COUNTY.

The Bluebird group of mines in Pixley basin, near Silver City, has been incorporated as the Tibo-Bluebird M. Co., capital $500,000, by J. McMillan, R. Aikman, M. B. Gwinn, F. Irwin, G. Clithero and J. G. Watts—the last named being the secretary.

SHOSHONE COUNTY.

It is stated that the sale of the Golden Chest mine, at Murray, has been concluded in New York at the price agreed upon in the bond—$800,000. The property consists of ten or twelve mining claims between Murray and Littlefield, together with water rights and water power plant. It has two mills of twenty stamps each, only one of which is now in operation, together with air compressor, pumps, hoists, concentrates, electric lighting plant, etc. The larger part of its value is in the form of free gold. It has been in operation about sixteen years. In its earlier days the methods were crude, but the tailings were impounded and there are thousands of tons ready for a cyanide plant.

The Manhattan M. Co., operating near Harrison, has struck a 5-foot vein of ore which is said to show an average of $34 per ton in silver and lead.

WASHINGTON COUNTY.

W. C. Meeker of New York has organized in New York the Azurite M. Co. to operate a group of claims near Cuprum, in the Seven Devils district. S. M. French is president and W. C. Meeker manager.

The placer mines on Goose creek, near Meadows, are to be operated this season by J. W. Butler & Co., who expect to take out $10,000. With one giant last year they took out about $7000. This year they will run two giants. The ground is river wash, is on a hill side and is covered by a ditch 1 mile long.

MICHIGAN.

HOUGHTON COUNTY.

The annual report of Supt. Parnell of the Osceola Con. M. Co., at Houghton, for the year ended Dec. 31, 1901, says: "In the old mill—which we have evidence to know compares favorably with any of the old mills treating amygdaloid rock—we have never been able to reduce the losses in the tailings below from .25 to .27 of 1%, an average of about .26. In the new mill the average for the year was .094. Twenty-six hundredths mean 5.2 pounds of mineral, which, at 72% fine, means 3.74 pounds of ingot per ton of rock. Ninety-four thousandths losses mean 1.35 pounds mineral per ton of rock; at 72% fine this means 1.35 pounds ingot per ton of rock, or a difference of 2.39 pounds of ingot per ton of rock. The two Osceola mills the past year stamped 687,094 tons of rock. A difference of 2.39 pounds per ton means 1,642,154 pounds of ingot copper, which at, say, 10 cents per pound, figures a value of $164,215 in round numbers. Add to this a difference of cost in stamping of, say, 5 cents per ton—it will certainly amount to that much—which is $34,354, and we have:

Savings in tailings	$164,215
Savings in stampings	34,354
Total	$198,569

MONTANA.

BEAVERHEAD COUNTY.

The Indian Queen mine, near Dillon, owned by J. Annear, J. Broughton, B. Annear and the estate of R. Dawe of Butte, is being developed through an 800-foot tunnel that taps the vein at a depth of 450 feet and a winze 150 feet deep sunk at a point 100 feet from the face of the tunnel. The ore is high grade and is being shipped to Butte for reduction.

FERGUS COUNTY.

J. Fahl has sold the Cora and Minnie Healy claims at North Moccasin to F. Elliott for $1225.

J. F. Robinson, for the Colorado & Montana Mines Co., of which he is vice-president and manager, has bonded from W. G. Norman the Paymaster, Gray Horse and Monday claims at North Moccasin. The price is $55,000. Assays of surface ore are considered so satisfactory that a development of the property will at once be commenced.

J. Leslie reports a shaft sunk 70 feet on the Blue Dick copper mine, near Lewiston, exposing a body of copper ore, 6 feet of which is high-grade carbonate.

FLATHEAD COUNTY.

The Libby G. M. Co., of Kalispell, A. L. Jaqueth, manager, operating on Fourth of July creek, has bought a 10-stamp mill, which it expects to get in operation this summer.

JEFFERSON COUNTY.

The Mollie McGregor mine on the Boulder river, owned by J. H. Curtis of Butte and the estate of A. G. Clark of Helena, has been leased to A. Doehler and M. Matson for eighteen months. The mine is developed by a 150-foot shaft and a 90-foot tunnel. The lessees intend to begin work at once.

MADISON COUNTY.

In the Boss Tweed Extension mine, at Pony, owned by T. C. McGrath, the vein has been crosscut 30 feet and the opposite wall has not been reached. The ore is gold bearing. In the Jeanette, which adjoins the Boss Tweed Extension, the vein is a continuation of the one in the Extension and is said to be fully as rich. The mine is being opened by a shaft and tunnel.

C. Austin, manager for the Red Bluff G. M. Co., Ltd., at Red Bluff, says the company will build a 100-ton concentrating plant.

MISSOULA COUNTY.

The St. Patrick M. Co. has been incorporated at Missoula to operate mines and mills and electric power plants. The directors are T. H. Elliott, A. O. Elliott, W. G. Ranft, J. B. Porter and T. C. Marshall, all of Missoula.

SILVER BOW COUNTY.

The Denier mine, at Butte, owned by T. M. Hodgens and Mrs. L. Largey, is reported sold to the Anaconda Co. for $75,000.

The annual meeting of the stockholders of the Montana Standard M. Co. was held at their office, No. 106 West Granite street, Butte, Montana, March 10th. The following members were elected trustees for the ensuing year: P. T. Davis, F. T. Britton, D. C. Smith and A. N. Yoder of Butte; L. Wottrich, Marysville, Mont.; N. L. Lennan, St. Paul, Minn. P. T. Davis was elected president; L. Wottrich, vice-president; F. Britton, treasurer, and W. H. Lindsay, secretary. At the meeting the stockholders bought treasury stock to the extent of $5000. A contract was let for a 400-foot extension of the La Blanche tunnel.

Suit has been brought in the District Court at Butte by J. A. Boyer to recover from the Washoe Copper M. Co. $150,000 which, it is claimed, is the value of ore alleged to have been illegally extracted by the Washoe Co. from beneath a lot belonging to Boyer. An injunction is also asked.

NEVADA.

LINCOLN COUNTY.

The work on the late discovery of cinnabar, called the Red Cloud, near Goodsprings, is being pushed ahead by Armstrong & Loop, the discoverers. The shaft is down 50 feet and the ore streak is from 8 to 15 inches in width. The average, it is claimed, assays $34 gold and 15% quicksilver.

The Keystone group, near Sandy, has been bonded to the Doke Bros. of California, and they are working twenty men on a newly discovered shoot of ore, which is soft and clayey in character, but rich. A mill has been erected at Sandy, 8 miles distant from the mine. C. Anderson is metallurgist for the company.

The E. & F. M. Co. has been incorporated in Salt Lake City, Utah, capital $100,000, with A. C. Ellis president and F. Higginbotham secretary and treasurer. The company owns the Ida May, Lone Star, Silver King, Bully Boy, Sentinel, Copper Chief and the Iron Mine claims, with an option to purchase the Highland Mary claim, all at Bristol. In the developments is exposed copper and gold bearing ores. E. Freudenthal is Supt.

The wet process and the Chilian mill that has replaced the old mill at De Lamar has handled the ores of the De Lamar mines so satisfactorily, states H. A. Cohen, the general manager, that two more machines are to be added immediately. With this added equipment the plant will treat at least 150 tons of gold-bearing ore daily.

LYON COUNTY.

J. N. Beck of Wellington reports work on the Yankee Girl claim, which he is operating at that place, as making a satisfactory showing. One of the ledges is

about 10 inches wide and the ore goes about $100 to the ton. It is his intention, as soon as a little more development work is done, to put a small 2-stamp mill on the property.

NYE COUNTY.

The Tybo M. & R. Co., operating the 2 G and other mines at Tybo, are projecting the construction of a concentrating plant.

The New York G. M. Co. has been incorporated in Salt Lake City, Utah, capital $37,500, with G. A. Land president and E. L. Hall secretary and treasurer. The company owns three mining claims at Tonopah.

The new working shaft of the Tonopah M. Co. is being rushed by contract work and is making good headway. The Brougher shaft is down close to 270 feet, showing a ledge 12 feet wide in the bottom. The drifts on the 250-foot level from this shaft and the Cutting shaft are beginning to show up fine ore.

NEW MEXICO.

COLFAX COUNTY.

At the Denver mine at Elizabethtown the pumps are in operation taking water out of the shaft. It is the intention of the company to work in the old incline shaft and also to drive a tunnel 700 feet lower down the hill to intersect with present workings, providing drainage of the upper works and a direct way to the mill. M. Walsh is manager.

SIERRA COUNTY.

Manager Kasser of the Hillsboro G. M. & M. Co. claims a showing of $100 ore on his mine near Hillsboro.

The Galles Bros. & Hartney are retimbering the workings of the American mine near Hillsboro. There is in sight 6 to 18 inches of good ore.

J. Kassar, manager of the Hillsboro M. & M. Co., has decided upon the erection of a 10-stamp mill for the treatment of the ores from the Ready Pay group of mines at Hillsboro.

Galles Bros. & Hartney, who are operating the American mine at Hillsboro, have opened up a 12-inch streak of ore which, they claim, averages about $100 per ton in gold.

O. E. Conner of Cincinnati, Ohio, has taken an option on a group of seven claims near Animas Peak, near Hillsboro.

The Las Animas G. & C. M. Co. at Hillsboro has opened up a body of high-grade ore on their 200-foot level.

SAN MIGUEL COUNTY.

Three reduction plants at Las Vegas within the next six months are a possibility. A dozen companies have been organized for development work on copper propositions in the country tributary to Las Vegas. The ore deposits found are great bodies of sandstone carrying, it is stated, from 2% to 10% copper in carbonates, and so situated that the ore can be mined and hauled 12 miles to a reduction plant for $1.25 per ton. It is claimed that the mill cost for treating it will not exceed $2.75 to $3 per ton.

OREGON.

BAKER COUNTY.

The ore shoot at the Gem mine, near Sparta, has been encountered on a level 100 feet below the present workings. The mine is owned by Geiser Bros., of Baker City.

GRANT COUNTY.

The Red Boy Extension Co. has been incorporated at Portland by B. I. Cohen, W. E. Hurd and E. J. Hurd. The capital is $1,500,000.

JACKSON COUNTY.

W. B. Dennis, of the Black Butte quicksilver mine in Lane county, has bonded the Golden Fleece mine, at Ashland, at $20,000, of E. K. Anderson. In the sandstone bedrock where a portion of the soft conglomerate has been hydraulicked off are seams of calcite, associated with cinnabar ore, which it is proposed to develop to depth.

JOSEPHINE COUNTY.

A rich strike is reported made at the Granite Hill quartz mine of the Louse Creek district, near Grants Pass, owned by Booth & Mangum. In the tunnel a 3-foot ledge has been uncovered showing free gold. A 5-stamp mill is kept in operation at the mine.

SOUTH DAKOTA.

CUSTER COUNTY.

The North Star M. Co. is preparing to build a 20-stamp mill on its ground, 9 miles from Custer, and has the excavations and foundation completed. It is intended to have a cyanide plant in connection. The mine is developed by a shaft 340 feet deep. The ore, it is claimed, will average $20 a ton, about one-fourth of it amalgamable.

LAWRENCE COUNTY.

The new cyanide plant at Spearfish, which has been in course of construction for some time for the Spearfish G. M. & Red. Co., has been started up. It replaces the plant destroyed by fire last fall. The old plant had a capacity of 125 tons. The new plant, of 300-ton capacity, has been built in a very short time at a cost of $41,000. The mill has ten leaching vats, 7x26 feet each, with a capacity of 160 tons of ore to each vat. The system of operation will be to empty and refill one vat every ten hours, allowing seventy-two hours for leaching. The ore bins are placed immediately over the crushers in the mill and have a capacity of 250 tons. The ore is mined from open pits and delivered to the mill by a steam locomotive tramway.

UTAH.

GRAND COUNTY.

A company has been organized in Colorado Springs, Colo., for the purpose of operating placer mines on the old bars along the Grand river. Two placer machines are being built. M. Kinney, E. H. Holbrook and M. S. Beach of Colorado Springs are interested; the machines are to be placed in operation along the river from Dewey, at the mouth of the Dolores, to Moab, a distance of 30 miles.

IRON COUNTY.

T. Ferguson, Supt. of the Iron Mountain C. M. Co.'s properties at Iron Mountain, says that at a depth of 200 feet in the main shaft, in a crosscut 110 feet in, copper sulphide ores are showing. Nearer the surface 14 feet of ore that averages 9% copper has been opened up.

JUAB COUNTY.

It is understood that Manager G. C. Moore of the Sunshine, at Tintic, is to be retained in making the tests of the leaching ores of the Mammoth, the company to act on his recommendations in the erection of a plant.

WYOMING.

CARBON COUNTY.

E. P. Jennings of Salt Lake City says that the control of the Carisa M. Co.'s properties at South Pass has been passed to P. L. Kimberly and H. M. Ryan of Salt Lake City and associates. The operation of the property is to be continued upon the most energetic scale. A 50-stamp mill is to be installed.

FOREIGN.

BRITISH COLUMBIA.

Work on the Imperial mine, on Munro mountain, near Atlin, by Pearse & Co., consists in stripping the ledge above the old workings and prospecting. They expect to put in a crusher and stamp mill.

The sample mill of the smelter near Greenwood, recently bought by the Montreal & Boston C. Co., is being dismantled, preparatory to putting in a larger plant. A rock crusher, sampler and a large engine are being installed. Much of the sampling plant at first put in will be used, but it will be supplemented by the heavier machinery.

At a meeting at Greenwood of the Royal Victoria G. M. Co., Ltd., owning the Golden Eagle near the Volcanic claims, on the North Fork of Kettle river, authority was given to the management to make a sale of the mine.

The manager of the Ymir mine, at Ymir, reports that during February eighty stamps ran 656 hours (twenty-seven days, eight hours); estimated profit on operating is $9472. The grade of ore shows considerable improvement during the present month, drawn from the same stopes.

YUKON TERRITORY.

A smelter test of $126 per ton is reported from quartz taken from a group of claims near the Dome, at the head of El Dorado creek, in the Klondike district.

The Ladue mill, at Dawson, is running its 850-pound stamps crushing on rock from Hunker creek. The rock carries, besides free gold, considerable gold-bearing galena which is concentrated from the tailings. The results from the different runs of rock are declared to be satisfactory.

The contract of the Treadgold concession and the Canadian Government provides that he shall have 25,000 miners' inches of water, one-half of which he is to use himself and the other half sell to the present Klondike miners at 25 cents a miners' inch per hour. This would amount to $150 a day for each claim using a sluice head. There is no claim in the whole country that would be able to pay that sum. During the richest condition of the claims the highest rate ever charged was $7 or $8 an hour, and very few claims were ever able to pay that.

Personal.

J. T. McCALL, of San Francisco, is in Tonopah, Nev.

T. A. RICKARD of Denver, Colo., is in San Francisco.

W. BROADBRIDGE has returned to London from Pahang.

I. E. ROSE has opened an assaying office in Baker City, Or.

J. DUFFIN AND J. GILES, of De Lamar, Cal., are in Tonopah, Nev.

H. L. WASHBURN of Cripple Creek, Colo., is in Tombstone, Ariz.

R. W. HUNT of R. W. Hunt & Co., Chicago, is at Monterey, Cal.

J. H. SHOCKLEY has returned to Telluride, Colo., from Pasadena, Cal.

J. A. PANTING has returned from Boise, Idaho, to Baker City, Or.

S. E. PAUL has returned to Salt Lake City, Utah, from Los Angeles, Cal.

C. A. SNYDER will in future be ore buyer for the Val Verde, Ariz., smelter.

EDMUND JUESSEN, mining engineer of Spokane, Wash., is in Chicago for a time.

J. A. YERRINGTON of Hawthorne, Nev., is in New York on mining business.

K. FARNSWORTH has resigned as Supt. of the Bullion Beck mine at Tintic, Utah.

R. CHAUVENET has resigned the presidency of the Colorado State School of Mines.

R. D. FEATHERSTONHAUGH has returned to Atlin, B. C., from a trip to London.

F. H. DAVIS, of the Davis Calyx drill, has returned to Virginia, Nevada, from Arizona.

E. BARTON has been appointed manager of the Black Hawk mine at Randsburg, Cal.

FRANK W. GRIFFIN of Griffin & Cameron, has returned from Oroville, Cal., to San Francisco.

HENRY KEHOE, a mining engineer of Spokane, Wash., has returned there from San Francisco.

A. H. ELFTMAN, managing director of the Miller M. Co. of Brownsville, Cal., is at Silverton, Colo.

E. L. UREN, C. E., formerly of Grass Valley, Cal., and now of Wardner, Idaho, is at Iowa City, Cal.

EDW. BRAYTON of the Pelton Water Wheel Co. of San Francisco returns from the East next week.

L. W. SHIRLEY is now in charge of publicity department of Link Belt Machinery Co., Chicago.

B. N. SHOECRAFT, secretary Champion M. Co., has returned from Nevada county, Cal., to San Francisco.

JNO. H. MARKS, of the Gold Pan M. Co., Breckenridge, Colo., has returned there from San Francisco.

THOMAS JONES, Supt. of the Wood & Bamberger mine at Battle Mountain, Nev., is in Salt Lake City, Utah.

GEO. L. WALKER of the American Steel & Wire Co. has returned from Portland, Or., to San Francisco.

THOS. J. STEELE succeeds Geo. M. Nix as general manager Hidden Fortune M. Co., Deadwood, South Dakota.

A. J. McCONE of Harron, Rickard & McCone has returned from Nevada county, Cal., to San Francisco.

S. V. TRENT of the Trent Engineering & Machinery Co. has returned from Redding, Cal., to Salt Lake City, Utah.

C. A. STRITE, late of Plumas county, Cal., is foreman at the Bloss & McClary hydraulic mine at Trinity Center, Cal.

E. C. ENGLEHART, who has been sojourning for several months in Los Angeles, Cal., has returned to Denver, Colo.

C. A. CUMMER of Cummer, Son & Co., Cleveland, Ohio, is in Mexico in the interest of ore drying machines of their manufacture.

W. J. CHALMERS, treasurer and director in the Allis-Chalmers Co., has gone to Europe in connection with business of his company.

T. J. HARTMAN, M. E., formerly of Leadville, Colo., but now located at Coolgardie, West Australia, was in Denver, Colo., last week.

F. R. CULBERTSON of Spokane, Wash., manager of the Chloride-Bailey gold mine at Dedrick, Cal., will locate his office at San Francisco, Cal.

H. Z. OSBORNE, a prominent California miner, has been reappointed by President Roosevelt United States Marshal for the southern district of California.

O. W. GRIFFITH of Colfax, Cal., has been put in charge of the gravel washing department at the Bob Lewis No. 2 gravel mine, near Westville, Cal.

F. PEEBLES, late of the Val Verde smelter at Val Verde, Ariz., has taken position as one of the foremen at the Shannon smelter at Clifton, Ariz.

HARRY BRETHERTON, late assayer reduction works, Silver City, N. M., has been appointed chemist for the A. S. & R. Co., Aguas Calientes, Mexico.

J. L. PARKER, former Supt. Dominion Copper Co.'s Phœnix, B. C., property, is now back to his former position as Supt. North Star M. Co., Kimberly, B. C.

JULIAN SONNTAG, part owner and secretary Providence mine, and general manager Giant Powder Co., has returned from Nevada county, Cal., to San Francisco.

WESLEY MERRITT, industrial commissioner Atchison, Topeka & Santa Fe Railway, has been in Indian Territory and New Mexico looking over mineral properties.

JOHN K. MACKENZIE, mining engineer, of Dickman, Mackenzie & Potter, has left Chicago for Guadalajara, Jalisco, Mexico, near which place he will make a mine examination for Chicago people.

R. T. WHITE has resigned as Supt. of the Highland Boy smelting plant at Bingham, Utah. W. C. Thomas, late of the Butte & Boston smelter at Butte, Mont., succeeds to the position vacated.

J. L. McVICAR, electrician at War Eagle mine at Rossland, B. C., for several years, has gone to West Africa to take charge of the electrically operated diamond mine drill plant of an English syndicate.

E. G. EWART has resigned his position with the Link Belt Machinery Co. of Chicago and accepted a similar position with the H. W. Caldwell Son Co., Chicago. Mr. Ewart is in charge of the publicity department.

Commercial Paragraphs.

THE Standard Diamond Rock Drill Co. will soon begin operations, with Chicago as headquarters.

THE Oakland Iron Works, Oakland, Cal., has the contract for manufacturing the auxiliary machinery for a dredger for Portland, Or., for $54,154.

THE Trenton Iron Co., of Trenton, N. J., has the contract for the aerial tramway, 15,600 feet, fifty tons per hour, for the U. S. M. Co., Bingham, Utah.

THE Mine and Smelter Supply Co., of Denver, Colo., is sending via San Francisco eight carloads mining machinery to the Inca M. Co., Tirapata, Peru, an 8500-mile trip.

D. KEITH, T. KEARNS, and others of Salt Lake City, Utah, are reported to have organized a company to operate a large machinery supply house in Salt Lake City, J. E. Galigher to be the manager.

FRANK L. SIZER, who has been engaged on the winning side of the Plymouth-Silver King suit just completed at Butte, Mont., has gone to Mexico, where he is operating the Rosario mine, south Chihuahua, for C. W. Clark.

THE Ingersoll-Sergeant Drill Co. have an order from the Gold Creek Consolidated M. Co., of Jersey City, for a complete outfit consisting of air compressors, receiver, drills, etc., for the Mascot group of mines, Oro Fino, Idaho.

THE Allis-Chalmers Co., because of immense amount of business on hand, has had to open up a part of the old Fraser-Chalmers plant on West Lake St., Chicago, where they will manufacture perforated metals, this part of the company's business having grown to large proportions.

THE Jeanesville Iron Works Co., Denver branch, A. Middlebrook, manager, reports, among recent sales and shipments, one to the Vindicator mine, Cripple Creek, Colo., of one compound condensing pump, capacity 500 gallons, 1200-foot lift; to the Golden Cycle mine, Cripple Creek, Colo., one mine pump, 1200 gallons, 1000-foot lift; to the Iron-Silver M. Co., Leadville, Colo., one pump, 500 gallons, 900-foot lift; to the Nisi Prius mine, Leadville, Colo., 500 gallons, 900-foot lift pump; to the Gold King mine, Cripple Creek, 500-gallon pump, 800-foot lift; six electric station pumps for Old Mexico.

THE Westinghouse Machine Co., East Pittsburg, Pa., has recently entered the field as builders of blast furnace blowing engines, and has contracted within the last few weeks for six large vertical blowing engines—three for the Toledo Furnace Co., Toledo, Ohio, and three for the South Chicago Furnace Co., South Chicago. These engines are to be arranged so as to run as compounds, or each engine can be run separately as a simple engine. Each of the stations will have two high-pressure engines and one low pressure, as relates to the steam end. The low-pressure engine is to be used as an auxiliary; when it is in use the high-pressure engine will receive steam at boiler pressure and exhaust into receiver, from which the low-pressure en-

gine will be supplied. When the low-pressure engine is in use as a simple engine, it will receive steam from the boiler through a reducing valve. The high-pressure engines will have steam cylinders, 50-inch bore, fitted with modern design of Corliss valve gear. The low-pressure engines will have steam cylinder, 96-inch diameter, also equipped with Corliss valve gear. The air cylinders will be 96-inch diameter in all the engines, and the stroke of all will be 66 inches. The engines are expected to run safely and quietly at a speed of sixty revolutions per minute. The air cylinders will be equipped with patent piston valves for induction and eduction. The engines are of the type having the air cylinder below, the steam cylinder above, the two being connected by a long type crosshead carrying a connecting rod to a flywheel on either side of the engine. These engines are to be extra heavy, and are specified to embody the highest type of material, workmanship and design.

C. O. BARTLETT & Co. have incorporated their business under the laws of the State of Ohio to the following: The C. O. Bartlett & Snow Co., and have purchased a tract of land with buildings and power plant consisting of 150 H. P. boiler and engine. The property comprises sixteen lots or one entire block, situated in the central part of Cleveland, with fine railroad facilities. It is bounded by Winter, Leonard, Summer and French Sts. Other buildings will be added and they expect to have a first-class plant in every particular. C. O. Bartlett will be president, and K. F. Snow vice-president and general manager.

Latest Market Reports.

SAN FRANCISCO, March 28, 1902.

METALS.

SILVER.—Per oz., Troy: London, 24⅞d (standard ounce, 925 fine); New York, bar silver, 53⅞c, refined (1000 fine); San Francisco, 53¾c; Mexican dollars, 44½c San Francisco, 43⅛c New York.

On the 26th, in London, at a meeting of the stockholders of the Bank of Africa, the chairman said that it was calculated that, owing to the closing of the South African mines during the last two and a half years, the world's gold supply was short to the extent of forty millions.

COPPER.—New York: Lake, 1 to 3 casks, $12.50; carload lots, $12.25; Electrolytic, 1 to 3 casks, $12.25; carload lots, $12.50; Casting, 1 to 3 casks, $12.00; carload lots, $12.25. San Francisco: $14.00. Mill copper plates, $17.00; bars, 18@24c. London: £52 10s per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4⅛o 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £11 7s 6d per ton.

SPELTER. — New York, $4.35; St. Louis, $4.00; London, £17 10s per ton; San Francisco, ton lots, 5¼c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN. — New York, pig, $26.25; San Francisco, ton lots, 27c; 1000 lbs., 27½c; 500 lbs., 27¾c; 200 lbs., 27½c; less, 28c; bar tin, ℔ lb, 30c.

PLATINUM.—San Francisco, crude, $17 ℔ oz.; New York, $18 per Troy oz

QUICKSILVER. — New York, $51.00 large lots; London, £8 15s; San Francisco, local, $47.50 ℔ flask of 76½ lbs.; Denver, $51.00. Export, $45.00.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 18c; San Francisco, Plumbers', 100-lb. lots, 14.20c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $17 00; gray forge, $17.75; San Francisco, bar, 2 75 ℔ lb .,3c in small quantities.

Good authorities say that from now on the pig iron output will show a material increase, and that the demands of consumers will be more readily satisfied.

STEEL.—Bessemer billets, Pittsburg, $32.00; open hearth billets, $32.50; San Francisco, bar, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2 65; Hewmoor, $2.50; Trowell, $2.50 per bbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11 75, long ton.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2¾@3c ℔ lb.; blue vitriol, 5¾@6¼c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2¼@2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¾c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., per lb., 7½c; in 25 lb. tin pails, ¼c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¾c; do. in kegs, 7½c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c

ASSAY LITHARGE.—Per lb, 9c.

BISMUTH.—Subnitrate, por lb., $1.60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c: calcined, 20c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2¼ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Recently Declared Mining Dividends.

	Payable.
Con. Mercur G. M. Co., Utah, 5 cents per share, $30,000	April 7
Ontario S. M. Co., Utah, 30 cents per share, $45,000	March 20
Rambler-Cariboo M. Co., British Columbia, monthly, 1 cent per share	March 30
United States R. & R. Co., Colorado, quarterly, 1½%, $60,000 on preferred, No. 1, 1%, $60,000 on common	April 2

WANTED.

CAPITAL WANTED.—I am in a position to secure a valuable quartz proposition (gold). Can get a good working bond on same. Will give best of reference as to character and ability. W. B. GRANT, Tuttletown, Tuolumne Co., Cal.

STAMP MILL WANTED, either ten or twenty stamps, second hand, as near Amador County, California, as possible. Must be in good condition, and low as to price—advertiser has himself built mills and then tried to sell, so don't quote fancy figures. Water-power mill preferred; steam no objection, however. Give full details, price, location, condition. Concentrators acceptable if with plant. Will also buy small hoist and any good second hand mine equipment. Address E. N. DARLING, 9 Pine St., New York.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDINO MARCH 18, 1902.

695,871.—PUMP—Ames & Fulton, Galt, Cal.
695,781.—GRADER—J. Bagley, Tacoma, Wash.
695,432.—DRAWER OPENER—C. H. Bakeman, Snohomish, Wash
695,801.—CONFECTIONERY MACHINE—W. S. Dillon, S. F.
695,545.—SKIRT ELEVATOR—G V. Egan, S. F.
695,453.—HINGE—Rose Frank, S. F.
695,807.—THRUST BEARING—Fulton & Ames, Galt, Cal.
695,718.—BUILDINO CONSTRUCTION—A. Goodman, S. F.
695,608.—STAMP CANCELER—J. Guidinger, Los Angeles, Cal.
695 6 0 — RAIL BRACE—J. Jensen, Black Diamond, Wash.
695,461.—AX HANDLE CLAMP—L. Johnson, Seattle, Wash.
695,815.—HYDRAULIC PUMP—C. Lakenan, Grass Valley, Cal.
695,61 —BOILER—C. F. Lake, San Bernardino, Cal.
695,818 —SOFA COUCH—L. C. Le Count, Los Angeles, Cal.
695,462.—CAN BODY BLANK—J. Lee, S. F.
695,745.—DRILL—J. W. Livermore, Berkeley, Cal.
695,574.—FIREARM—J. B. Mahana, Kelso, Wash.
695,748.—PIPE MACHINE—Martin & Ormand, Riverside, Cal.
695,749.—PIPE MACHINE—Martin & Ormand, Riverside, Cal.
695,868.—FURNACE—F. Nevegold, Portland, Or.
695,830.—BOISTING GEAR—F. V. Nielsen, S. F.
695,836.—CAMERA—W. L. Root, Spokane, Wash.
695,588.—VALVE—O. O. Storie, Tacoma, Wash.
695,589.—VALVE O. O. Storie, Tacoma, Wash.
695,514.—CAN HEADINO MACHINE—G. Wilcox, Los Angeles, Cal.
695,515.—CAN FUSING MACHINE—G. Wilcox, Los Angeles, Cal.
695,516.—CAN DIPPING MACHINE—G. Wilcox, Los Angeles, Cal
695,517.—CAN SEAMINO MACHINE—G. Wilcox, Los Angeles, Cal.
695,518.—CAN SOLDERINO MACHINE.—G. Wilcox, Los Angeles, Cal.
695,519.—CAN BODY MACHINE—G. Wilcox, Los Angeles, Cal.
695,520.—CAN SOLDERING MACHINE—G. Wilcox, Los Angeles, Cal
695 521.—CAN SIDE SEAMINO MACHINE—G. Wilcox, Los Angeles, Cal.

SITUATIONS WANTED.

MINING ENGINEER, with many years experience as manager and superintendent, is open for an engagement. Also posted in mining and metallurgy. Is at present engaged as superintendent of a large copper mine. Address Engineer, care Mining and Scientific Press.

WANTED.—Position as Assayer and Millman by a practical man. Am a practical miner. Understands cyanide work and mine accounting. Competent to act as assistant superintendent. Can handle men. No objection to Mexico or British Columbia. Address O. T , care of this office.

WANTED.—Position by an experienced and reliable assayer of all metals, and Bookkeeper. Has also had five years' experience in general merchandise business. Will give references from one of the best gold-producing quartz mines in California. Wire or write E. C. M. W , care of Mining and Scientific Press.

A YOUNG MINING ENGINEER desires position with reliable mining or milling company as assayer, chemist, or surveyor and engineer. Technical graduate; practical miner before graduation, mill and emelter work since; cyanide preferred. Can handle men. Prepared to develop small properties. Good references. Address "A," Lock Box 772, Florence, Colorado

WANTED.—Position as Superintendent or Foreman of an amalgamation and concentration mill. Have had eighteen years' experience. At present time engaged as foreman with one of the largest companies in Colorado. Best of references furnished. Address "Millman," care of this office.

AN ALL-ROUND PRACTICAL MINER, TIMberman and Tool Sharpener wants position as Foreman; also good Surveyor. Twenty-two years' experience. Successful in handling men. Regular habits. Can earn my pay. Address L. A. P., this office.

MINING ENGINEER, practical miner and mill man, assayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best references. Now working in southern California. Address A. M. P , care of Mining and Scientific Press.

WANTED. — Position as superintendent of quartz mine. Worked as miner, engineer, mill man and superintendent. Superintendent at present. Would engage for foreign service. References given. Address Economy, this office.

WANTED.—POSITION AS MILL SUPERINtendent or Foreman. Understand concentration, amalgamation, cyaniding and assaying. Seventeen years' experience. Address "Mill Foreman," care of Mining and Scientific Press.

OPEN FOR ENGAGEMENT, A MINING AND Metallurgical Engineer. Eleven years' experience as Consulting Engineer and Manager. Graduated from the best technical schools in Europe. Specialty: examination and management of gold and silver properties. Location must be in California, Arizona or Nevada. Salary $5000 per year. Address C. A., care Mining and Scientific Press.

WANTED.—SITUATION AFTER MARCH 15, 1902, as Manager or Superintendent of mine. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work. Four years' experience as manager and superintendent. Treatment of low grade ores a specialty. Practical in every detail. State location of mine and salary. Best of references. Address X. Y. Z., this office.

DELINQUENT SALE NOTICE.

SILVER KING MINING COMPANY.—Location of principal place of business, San Francieco, California; location of works, Pioneer Mining District, Pinal County, Arizona Territory.

Notice.—There are delinquent upon the following described stock on account of assessment (No. 23) levied on the 31st day of January, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Name.	No. Cert.	No. Shares.	Amt.
F. Avery, Trustee	7393	1000	$250 00
F. Avery, Trustee	7415	400	100 00
F. Avery, Trustee	7416	300	75 00
Michael Levy	7353	100	25 00
Nat. Stein, Trustee	7243	50	12 50
Nat. Stein, Trustee	7247	50	12 50
John Turnbull, Trustee	6754	100	25 00
New York Issue.			
Wm. Hyndman	89	100	25 00
R. H. Merrick	188	100	25 00
Michael Levy	1015	100	25 00

And in accordance with law, and an order of the Board of Directors, made on the 31st day of January, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, No. 310 Pine street, Room 36, San Francisco, California, on TUESDAY, the 8th day of April, 1902, at the hour of 1 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of the sale.

J. W. PEW, Secretary.

Office—310 Pine street, Room 36, San Francisco, California.

DELINQUENT SALE NOTICE.

WILLIETTA MINING AND MILLING COMpany.—Location of principal place of business, San Francisco, California; location of works, Tuolumne County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 3) levied on the 20th day of January, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Name.	No. Cert.	No. Shares.	Amt.
Nolden, William	104	1 000	$10 00
Nolden, William	107	1,000	10 00
Nolden, William	108	1,000	10 00
Nolden, William	110	500	5 00
Nolden, William	112	500	5 00
Stayton, George E.	118	2,000	20 00
Stayton, George E.	172	500	5 00
Von Bonin, Carl	7	1,000	10 00
Von der Planitz, Emma	24	2,000	20 00
Von der Planitz, Emma	55	500	5 00
Von der Planitz, Emma	64	500	5 00
Von der Planitz, Emma	66	1,000	10 00
Von der Planitz, Emma	67	1,000	10 00
Trumpour, Carrie	31	250	2 50
Precht, Charles F.	40	500	5 00
Rowe, William	42	250	2 50
Newhauer, Henry R.	73	1,000	10 00
Hall, James H.	79	1,000	10 00
Geroke, William H.	80	1,000	10 00
Beckwith, Robert	96	4,000	40 00
Schwahacher, L. A.	159	500	5 00
Schwahacher, L. A.	160	500	5 00
Blum, Max	161	500	5 00
Blum, Max	162	500	5 00
Heintz, J. P. E.	166	250	2 50

And in accordance with law, and an order from the Board of Directors, made on the 20th day of January, 1902, so many shares of each parcel of such stock as may be necessary will be sold at public auction, at the office of the company, Room 233 Crocker Building, corner of Poet and Market streets, San Francisco, California, on MONDAY, the 7th day of April, 1902, at the hour of 1:30 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of the sale.

E. McALLISTER, Secretary.

Office—Room 233 Crocker Building, corner of Poet and Market streets, San Francisco, California.

DELINQUENT SALE NOTICE.

GARIBALDI MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Mariposa County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 2) levied on the 5th day of February, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Name.	No. Cert.	No. Shares.	Amt.
Baker, Estelle L.	59	400	$6 00
Cheney, A. L.	3	10	15
Cheney, R. L., Trustee	15	10,000	15 00
Cheney, R. L , Trustee	16	10,000	15 00
Cheney, R. L., Trustee	17	10,000	15 00
Cheney, R. L , Trustee	18	5,000	75 00
Cheney, R. L., Trustee	24	500	7 50
Cheney, R. L , Trustee	26	480	7 20
Cheney, R. L., Trustee	65	1,000	15 00
Cheney, R. L., Trustee	67	600	7 50
Cheney, R. L., Trustee	68	500	7 50
Cheney, R. L., Trustee	69	500	7 50
Cheney, R. L., Trustee	70	500	7 50
Cheney, R. L., Trustee	74	1,000	15 00
Cheney, R. L., Trustee	75	1.000	15 00
Cheney, R. L., Trustee	76	3,000	45 00
Gardiner, F. A.	73	1,000	15 00
Messer, A.	7	1,817	27 25
Monroe, H. E.	64	1,000	15 00
Porter, S. R.	5	10	15
Porter & Cheney	13	20,000	300 00
Porter & Cheney	14	10 000	150 00
Renehorne, R. H.	77	1,000	15 00
Renehorne, R. H.	78	1,000	15 00
Renehorne, R. H.	79	1,000	15 00
Renehorne, R. H.	80	1,000	15 00
Renehorne, R. H.	81	1,000	15 00
Renehorne, R. H.	82	1,000	15 00
Renehorne, R. H.	83	1,000	15 00
Renehorne, R. H.	84	1,000	15 00
Renehorne, R. H.	85	1,000	15 00
Renehorne, R. H.	86	1,000	15 00
Renehorne, R. H.	87	1,000	15 00
Renehorne, R. H.	88	1,000	15 00
Renehorne, R. H.	89	1,000	15 00
Renehorne, R. H.	90	1,000	15 00
Renehorne, R. H.	91	1,000	15 00
Wright, R. F.	61	500	7 50
Wright, R. F.	94	1,250	18 75
Wright, R. F.	95	1,000	15 00
Wright, R. F.	96	1,000	15 00
Wright, R. F.	97	1,000	15 00
Wright, R. F.	98	1,000	15 00

And in accordance with law, and an order from the Board of Directors, made on the 5th day of February, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, Room 15 Nevada Block, No. 309 Montgomery street, San Francisco, California, on MONDAY, the 7th day of April, 1902, at the hour of 4 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of the sale.

WILLIAM McPHERSON, Secretary.

Office—Room 15 Nevada Block, No. 309 Montgomery street, San Francisco, California.

MINING AND SCIENTIFIC PRESS.

Whole No. 2176.—VOLUME LXXXIV. Number 14. SAN FRANCISCO, CAL., SATURDAY, APRIL 5, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Copper Refinery at San Francisco, Cal.

A few weeks since this journal noted the existence of an industrial movement which, it was declared, would ultimately result in the establishment on the bay shores around San Francisco of the Pacific coast center of the metallurgical arts. The economic reasons for the anticipation of this were explained in some detail. Briefly recapitulated, they were the commercial supremacy of San Francisco as the seaport of the Pacific coast, the possession of the terminals of both established inland and sea transportation lines, the great extent of deep water frontage, cheap fuel and electrical power and a perfect climate.

These conditions will inevitably produce the suggested result, and it is, indeed, a question if the progress towards it will not be exceedingly rapid. The first addition to the already existing plants that is projected is a copper refinery, for which a tract of land has been bought near Rodeo, a few miles across the bay from San Francisco. On the bay shore there are already four smelters producing copper matte and in the interior of California twenty or so in operation or construction. In addition, on Puget Sound there are two operating and two more building. If the inland region west of the Rocky mountains be considered now, the aggregate natural supply of crude copper bullion that will become the raw material for the refinery will build it up into one of the great plants of this kind in the world.

From another point of view—that of the consuming market for manufactured copper—the enterprise is also timely. The success of long-distance electrical transmission in California has become the stimulus to additional projects of a similar character. There is at the time these words are being written not a possible water power in a California stream that is not the basis of a long-distance electric power transmission for early construction. These will very shortly require enormous quantities of manufactured copper, which the refinery will enable Pacific coast copper mines to supply without paying double and treble transportation charges across the continent from the mines to New York refineries, and back again past the mines to the installations in California.

Economically considering the cost of refining, the projected establishment, as a consequence of the comparative cheapness at San Francisco bay of the electric power from water, over electric power produced from steam plants at New York, should produce refined copper at a much lower cost than similar establishments at New York.

Insuring a commercial success to the projected refinery, there may then be summarized: the ability of the institution to pay the miner more for the raw material and to still have it cost less than to refineries at New York; the lower cost of refining on any scale of production, and the protection to it of a large consuming market by the transportation charge from New York to San Francisco.

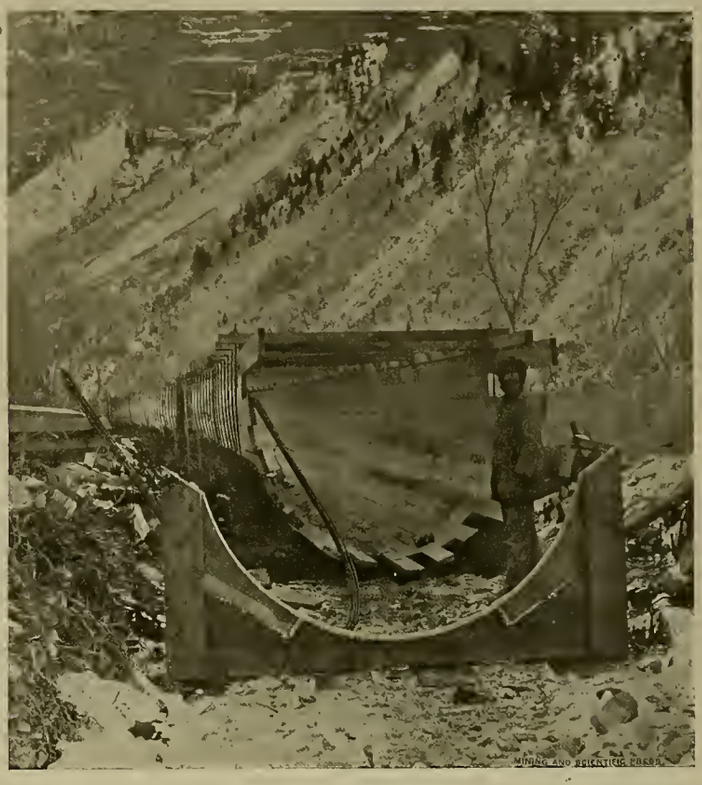


FIG. 1.

FIG. 2.

The copper mining industry of the Pacific coast should be benefited by the establishment of this institution. Copper produced here that now has to be shipped to New York for refining is worth from 1 to 2 cents a pound less at the matte smelter than it will be with the refinery and factory here. It is not to be assumed that all of the difference will go to the miner; but some of it will, and to the extent that it does it is the same to the miner as now is an increase in the market price of copper in New York.

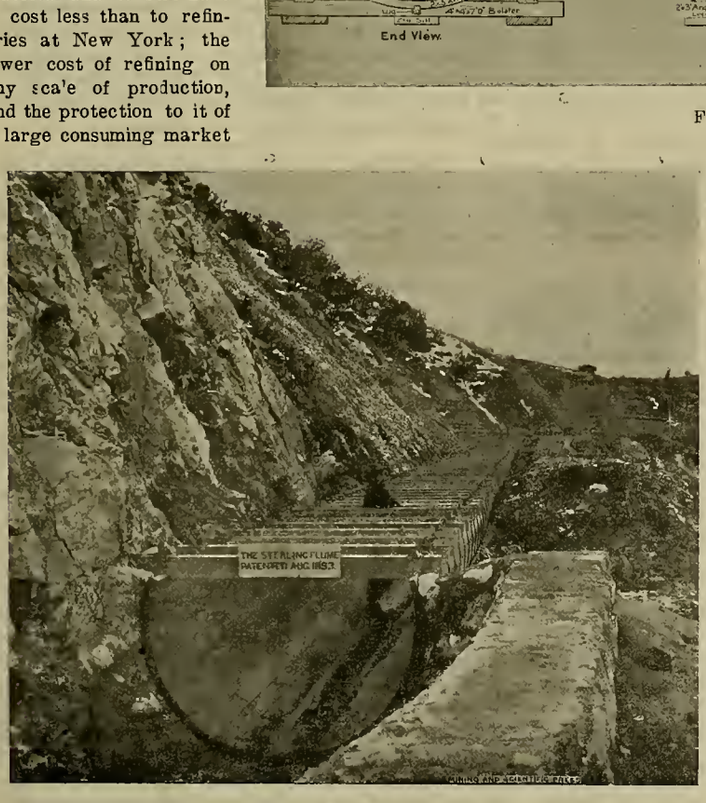


FIG 3.
The Stave and Binder Flume. (See page 189.)

THERE are a number of little things that may happen to a gas engine which the attendant must look out for. An oil cup may run dry or get stopped up. A lock nut may work loose on a valve stem, and, if not looked after, may wear off the cotter pin above it and allow the valve to drop into the cylinder. An ignitor wire may work out of the terminal nut and become grounded, thereby shutting down the engine. This last would not happen if the set screw in the terminal nut had been clamped down on the wire. A trip stem nut may work loose, so as to prevent contact taking place between the points of that ignitor, thus causing the cylinder to miss fire, or it may move in the opposite direction till it allows the points to remain permanently in contact, thus short-circuiting the other ignitors and causing a shut-down. An advantage of a two or three-cylinder engine is that a failure of one cylinder does not cause the engine to stop, and many small derangements may be cured while running. An exhaust valve may leak and need grinding. An ignitor may become grounded by moisture or carbon. A battery may become exhausted and need renewal. A bearing may need keying up. Backfiring is the ignition of the explosive mixture before it has entered the cylinder. A sharp explosion and a jet of flame from the air inlet usually accompanies it. That may be caused by a bad mixture of gas and air, burning so slowly that flame hangs in the cylinder during the whole of the expansion and exhaust stroke, thus igniting the incoming gases when the valve opens. Or, more rarely, a leaky inlet valve may allow the explosion flame to shoot into the mixture outside and ignite it. Backfiring should be cured, for it checks the speed of the engine and sooner or later necessitates new inlet valve springs. By driving the inlet valve down till the spring comes solid it often wedges one coil sideways over another, thus crushing them together, and decreasing the lifting power of the spring.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

San Francisco, April 5, 1902.

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THE Colorado mining property taxation hill as it finally got through the Legislature is a wohhly hit of law. Mines are to be assessed as at present—25% of the gross production, and "prospects" are to he assessed according to the smallest producer in the locality. That last word will stand considerahle different interpretation. The Colorado mining men feel that they are not as hadly cinched as they might have heen, as there is no increase on "mines," and as to "prospects," the courts have yet to determine what "prospects" and "locality" mean.

IN mine timhering it is calculated that square columns are ahout one-quarter stronger than round ones of the same diameter. The safe load on a timher column is calculated at 600 pounds per square inch for heights under 20 feet. Cedar and aspen are weak, showing an ultimate strength endwise of 4400 pounds per square inch; red pine gives 6300 pounds; white pine, 5400 pounds; hlack spruce, 5700 pounds. The strength of the stick is proportional to the area of cross-section over which the load is distributed. If a post has an area of 12x12 inches, and the bearing on its head is confined to a space of 6x6 inches, the timher will carry no greater load than if its full cross-section were only 6x6 inches. The strength of freshly cut timhers is from 25% to 40% less than that of seasoned timhers, and their life underground is likely to he from 40% to 60% shorter, heing subject to rapid decay and susceptible to fungus growth. The longevity of timher is increased hy maintenance of uniform conditions of dryness or moisture.

ON the 2nd inst. Robt. Mein of San Francisco, Cal., who has mining interests in South Africa, received a London cahlegram saying: "Peace negotiations about concluded." If pending overtures for settlement of the war prove successful, there will he immediate revival of deep gold mining in the vicinity of Johanneshurg. When resumption of gold mining in the Rand, S. A., takes place, the principal prohlem presented there in deep mining will be economical handling of the material. As the reefs that carry the gold dip into the earth at an angle of, approximately, 35°, it will hecome necessary in the progress of the work to sink vertical shafts to intersect the reef at a depth of from 7000 to 10,000 feet. Some time before the hreaking out of the Boer war this paper presented a plan in connection with such projected deep mining that comprised the installation of a hoist at the surface that would hoist from a depth of 2700 feet; at that depth another hoist of equal capacity, and at the 5400-foot level a third, to hoist from the 8000-foot. This involves, among other things, the question of what kind of power. To this it would appear that electricity only can be relied upon in such a case, though compressed air has claims to feasihility that justify attention. The matter presents a favorahle field for American enterprise and skill, with the customary attendant profit.

The Colorado Mine Owners' Association.

The preliminary meeting for the permanent organization of the Colorado mine owners into an association to accomplish several useful purposes was held in Denver last week. While the meeting was private, the conditions which have created the necessity for such an organization, and the ends which it proposes to accomplish, are well known and have heen frequently referred to by this journal in anticipation of the action just hegun.

The facts are that the interests which huy ores as raw material have hy consolidation become a virtual monopoly, and naturally use the power of their monopoly to huy ores cheaper, the transportation agencies have made a similar consolidation of interests, making a monopoly which naturally proceeds to use its power of monopoly to get more for the service than it hires out; and the lahor employed in the mines hy making its service a monopoly would get more for its service. The mine operators alone have made no consolidation of interests and naturally have become the hird to be plucked.

It is full time that they should, for protection, avail themselves of the same weapon of organization that is used so effectively against them. The lahor organization could, it would seem, well ally itself with the mine owners and operators against the real monopolies. This has been done successfully in California, where mining has had the power of monopoly applied to injure and destroy it. It is suggested to the mine owners and operators of Colorado that it would he well to make their organization on lines hroad enough to take in the working miners. The hurden to mine owners of increased wages, which increased costs of living inevitahly necessitate, would cease to be a hurden if the real burdens imposed by the monopolies were unloaded.

For the miners it would he well to consider now what the end of the present condition means, if the monopoly of ore buying—the smelter trust—and the monopoly of transportation become the real mine owners and operators. The anthracite coal mining of Pennsylvania is an illustration, the iron mining industry in Alahama and in Minnesota is another, and a third, closer at hand and more directly in point, is the lead-silver mining in British Columhia and in Mexico. Do the miners of Colorado wish to have their opportunity to earn a living to be at the will of the same smelter trust which is now closing down mines in Mexico? Unless the mine owners and operators of Colorado save their mines from the monopolies now threatening them, the Colorado miners will become as dependent as these Mexican miners are now.

For the present time the two monopolies that the mining industry in Colorado must suhordinate, if it would continue to he supreme in Colorado, are the smelter and mill monopoly, and the transportation monopoly of the railroads. These two monopolies are working together in an alliance, more effective, possihly, than if the two were one single monopoly.

There is only one method that will he permanently successful in defeating the smelter and mill monopoly, the ore huying trust. That method consists in not selling the ore to it. The position of the smelters and millers is that there is only one profit in metal production, and that they must have. There is no husiness reason why the mine owners should not take the position that if there is only one profit, that the mine owner should have it, and not the smelters and millmen. The mine owners must, then, own and operate their own mills and smelters. It is not necessary for each mine to own its own plant. The present system is the more efficient to save waste. It only requires a different ownership and a different policy. It is quite practicable for the Colorado mine owners' association to provide the hasis for organization which will accomplish this without affecting the complete independence of each individual mine operation. It cannot, however, he done hastily or without method, and it will cost money, which must he invested and risked.

The transportation difficulty is different. Mine owners and operators cannot expect to own and operate common carriers such as railroads. There is no question hut that the service the railroads give should be paid for so as to provide a profit for the service. The real question is entirely with the existing inequalities of payments for exactly equal services. There is ahsolutely no reason why low-grade ore should pay a less rate than high-grade ore. There is no reason in husiness or morals why the mine operator producing high-grade ore should pay part of the transportation cost of the mine operator producing low-grade ore. Transportation is a service that all should have on ahsolutely equal terms. Mine owners must first accept this principle for themselves, if they would have the right to have the metal produced by the smelter trust transported to market on precisely the same rates as the metal their own reduction works produce. Deny it and continue the present system and the smelting trust will have the precedent to sustain its present advantage hy which independent mine owners pay a large part of its transportation costs.

A Regretable Tendency.

This journal notes with regret the hindering tendency of some Californians who seem to consider any mining or metallurgical enterprise as an opportunity for hlackmail or suppression. There is scarcely any mining movement of note in California that has not had to fight a horde of mosshack nondescripts who seem to consider any enterprise in that line as a source of questionahle income to them by ways and means known to the shifty and the criminal in every clime.

Emboldened hy the success of the onslaught upon the California hydraulic miner, these knights of the road seek to hold up and despoil every measure looking to the advance of California mining and metallurgy. Whether it he the Mountain Copper Co., in Shasta county; the Copper King, in Fresno county; the Selby Smelting & Lead Co., in Contra Costa county, anywhere and everywhere that hrains, capital and opportunity comhine to develop California's mineral wealth comes a crew of cormorants clamorous for trihute. Their favorite weapon is an injunction, their favorite tool a hiased judge, and their favorite game an appeal to manufactured local opinion.

California is big enough and naturally rich enough to provide opportunities for all comers to create new clean wealth. It is a mistake to assume that the easiest way to get it is to take it away from some one else who creates it. It is a mistake to assume that the acceptance of an opportunity provided hy nature destroys other opportunity. The reverse is true. There is no excuse for the blackmail and legal hrigandage with which new enterprises sometimes meet. The toleration which has been given such action should be withdrawn. Try the other way a while. Remove ohstacles from the way of new enterprises instead of putting them in the way.

THE Chinese Government mining concession regulations are as they read prohibitive of mining hy foreign capital. Practically they are nothing of the kind. There has heen considerahle mining hy foreign and partly foreign companies in Manchuria for several years. The government taxes have heen ahout the same as now promulgated. The companies were not expected to pay them hy the officials whose business it was to make the collection for the Government. The operating companies simply made special contracts with the officials and compromised on much smaller payments. This mining was confined to gold, however. The Chinese have had no experience with any other kind of mining and the promulgated code is hut an expression of their ignorance. The tax collecting officials can he depended on to construe its provisions liberally to favor mining. The fixing of mining regulations with the knowledge that they are not to he enforced is an idea that Americans naturally find difficulty in comprehending. It is quite the Oriental way, however. Mining by foreign capital will get along under it and be profitahle. It would he a mistake to assume, though, that the mines in China are specially rich, or that the low wages will afford a larger profit margin and more opportunities than exist in the mines of our own country. Indirectly, however, the opening of mines in China will he an advantage in providing a market for mining machinery and other manufactures.

Concentrates.

AT the boiling point of any liquid its vapor pressure is equal to the atmospheric pressure.

CYANIDE OF POTASSIUM in ton lots is delivered at Riverside, Cal., for 25½ cents per pound.

THE Nevada statutes relating to the location of placer claims provide for the marking of the boundaries the same as on lode claims.

A COURT of competent jurisdiction decided last July that royalty need not be paid for the use of zinc dust in cyanide solution precipitation.

THE Act of Congress of March 3, 1891, makes it mandatory on a mine owner to keep the mine clear of standing gas and provide adequate ventilation.

THE consent of an owner of an undivided interest in mining ground to the establishing of a certain line as a boundary cannot bind his co-owner, not consenting.

THIRTY-NINE INCHES in fifteen minutes through granite with eight-pound hammers was the best record for double-handed drilling at Leadville, Colo., July 4, 1900.

A TEST TRIAL of chilled iron stamp shoes and dies indicates a consumption of iron per ton of ore crushed of about one pound in the shoes and about one-half pound in the dies.

THE present duty on blasting caps is $2.36 per 1000, or 24 cents per box of 100. In Europe a similar article can be obtained for less than the amount of duty. The duty on percussion caps, used for sporting purposes, is 30%.

IN case of the substance being a gas the heat necessary to change its form from a liquid to a gas must be in the substance, and whenever all this heat is removed the substance will return to its liquid form.

PORTLAND CEMENT is manufactured in California at Colton, San Bernardino county. A large Portland cement works has been projected at Suisun, Cal., and a large plant is under construction at Whatcom, Wash.

STRUCTURAL steel and iron are coming into more general and deserved use in and around mines and mining plants, lessening the liability of destruction by fire, reducing cost of insurance and adding to the life of the plant.

THE life of a steel wire rope is about two years of active work. This time can be greatly diminished by careless use. It can be increased much by having large sheaves and perfect lubrication of the internal wires of the rope.

THE resistance to traction per ton for a 1% grade due to gravity is 20 pounds, to which should be added 8 pounds per ton for rolling friction, making a total of 28 pounds per ton tractial resistance, as applied to pulling a carload up a 1% grade.

P. & B. PAINT, made by the Paraffine Paint Co., 116 Battery street, San Francisco, is good for either wood or metal. A marine paint for metals is made as follows: Red lead, 44; mercury, 24; thick turpentine, 5⅜ parts. Mix with linseed oil to the desired consistency.

SMOKE can be burned if the proper conditions exist. Most smoke consumers are, however, devices for insuring the complete combustion of fuel without the production of smoke, which is a much better plan than to attempt to burn the smoke after it has been formed.

THERE is considerable gold mining in Brazil, S. A., one mine—the Ouro Preto, in the State of Minas Geraes—employing 4500 men; but the inducements to American miners are very slight. English capital controls the mines and native labor is abundant and cheap.

THE notice of application for patent to a mining claim must be published in the newspaper nearest the location of the claim. It is strictly construed and the measurement is always of an air-line distance. It sometimes happens that publication in a newspaper that has absolutely no circulation in the locality of the claim.

THE hardness of aluminum varies according to its purity, the purest metal being the softest. Ordinary 98% aluminum is about as hard as copper. Aluminum becomes harder the more it is worked by rolling, drawing, stamping or hammering. The metal must be annealed in a close muffle, and must not come in contact with the open fire.

SKETCHES AND LINE DRAWINGS intended for reproduction by the zincotype process should be made using photographic black drawing ink. It is better to make them fairly large and let the photographing bring them down to a convenient size. Letters and figures should be made so that reduction by the photographing leaves them clear and distinct.

ASSESSMENT WORK on a mining claim, to validly hold it, must be performed by the claimant or in his interest. Work performed on the claim by another by mistake cannot count as assessment work, unless, indeed, the owner of the claim make it his work by paying for it. The owner of a mining claim is not compelled to pay for work done on his claim by the mistake of another.

IN deciding the case Sutter Co. vs. Johnson et al, brought in the Yuba Co., Cal., Superior Court to enjoin the operation of the Polar Star hydraulic mine, and to test the Caminetti law, the court holds that the law is not absolute and that the permits granted to hydraulic miners by the Debris Commission appointed under that law are no bar to injunction suits when the debris from the mines is injuring the rivers and valley lands, even though the miners have constructed dams in accordance with the plans and under the supervision of the Commission.

IT is as easy to transform all other forms of energy into heat and to lose that heat as to lose water out of a leaky barrel, and as hard to make the reverse transformation as it would be to fill the leaky barrel with a leaky dipper. Every time one kind of energy is changed into another some considerable part of it insists on appearing as heat.

IN the case of Duncan vs. Fulton, Pac. Rep. 61, 244, the Colorado Supreme Court decided that a description in a certificate of the location of a mining claim which locates the mine a certain distance from a patented mine is sufficient, since such patented mine will be presumed to be a natural object or permanent monument, until the contrary appears.

THE bromo-cyanide process is in successful commercial use at the Atlas G. & A. Co. mine at Hastings, Ontario, Canada. The ore is quartz, carrying gold associated with a large percentage of mispickel or arsenical pyrites. The ore is first amalgamated and some of the gold recovered. The concentrates are treated by the bromo-cyanide process and afterwards roasted for the arsenic.

AS to acetylene the light is relatively costly; it is practically impossible to utilize this gas in heating apparatus or in motors, for the cost of the material necessary to produce a cubic meter of acetylene gas is six times greater than the cost of a similar volume of coal gas, while the calorific power of acetylene is only three times that of coal gas. But acetylene gas may be advisable for isolated buildings with no central lighting plant within reach.

A METHOD of fireproofing wood is as follows: Subject the wood from six to eight hours to the boiling heat of a solution of 33 grammes of manganese chloride, 20 grammes of orthophosphoric acid, 12 grammes of magnesium carbonate, 10 grammes of boracic acid and 25 grammes of ammonium chloride, in 1 litre of water. The wood thus treated is incombustible even at great heat, and is protected by this method against decay, injury by insects, or putrefaction.

THE formula for a cement for cast iron has been published before, but in response to two inquiries is herein republished: Two ounces sal-ammoniac, one ounce sulphur, sixteen ounces boringe or filings of cast iron, are mixed well in a mortar and kept dry. When required for use one part of this powder is taken to twenty parts clean iron boringe or filings, and thoroughly mixed in a mortar; the mixture is made into a stiff paste with a little water, when it is ready for use. A little fine grindstone sand will improve the cement.

IN the case of the Cosmopolitan M. Co. vs. Foote, 101 Fed. Rep., U. S. 518, the U. S. Supreme Court decided that where, by mistake, a mining claim is located across instead of along, the vein passing through the location point, the rights of the locator are governed by the facts as they exist with regard to such vein. His side lines, as located, become end lines, and he is not entitled to any extralateral rights thereunder, although another vein, extending transversely to the one intended to be located, may have its apex inside of such surface lines.

IT is customary in the process of copper refining to leave a small quantity of oxide in the metal, in order to oxidize any trace of bismuth, arsenic or antimony which have not been entirely removed. As a result, these metals exist in the commercial product as oxides, and not as metals, which would form an alloy with the copper and so injure its quality. In making copper bars for the manufacture of wire of high electrical conductivity, and cakes to be rolled into sheet, this practice is, without doubt, beneficial; but it does not improve the copper for the manufacture of brass or other alloys. Zinc is a strong reducing agent, and a study of its thermo-chemical reactions has shown that it will reduce not only the oxide of copper, but the oxide of bismuth, antimony and arsenic also.

GOLD found casually by any person, working for another, in grading a millsite on the public domain, is not acquired by the employer in California. The California civil code, Section 1985, provides that "everything acquired by an employe by virtue of his employment, except his compensation, shall belong to the employer;" but gold found casually on the public domain by an employe belongs to him and not to the employer, and the former can maintain an action against the latter for a wrongful conversion of gold so found. A decision to this effect was due to the fact that a number of graders found a pocket of gold worth $600 while leveling off for a quartz mill on public land. The employer took possession of the gold under the idea that it was his "by virtue of his employment." The court held that gold so found is an adventitious find, and, being found on the public domain, rightfully belongs to the finder. The case was fully reported at the time in the Mining Law Journal, Denver, Colo.

A FALL of 450 feet will provide by gravity more than the power required to operate a suspended cable tram for ore carriage for 1400 feet of distance down hill. It will provide just about the power required for the gravity operation of a three-rail car tram for the noted distance. The track rails could be made of scantlings, or even poles with the sides and tops faced off. A steel cable should be used, but a hemp cable could be. A single-track jig could be used, constructed as described in the MINING AND SCIENTIFIC PRESS of Feb. 8th of this year. If these tram constructions can not be considered, a wagon road can be built of any practicable grade up to 18 feet in 100. The lighter the grade the better, but with 18 feet to 100 a team can haul up the empty wagon. If the side hill cutting is rock and costly, the road can be made for a special narrow-track wagon, 3-foot gauge even. A sled can be used on a still steeper road. It is preferable, if a road has to be built, not to economize on it at the expense of the grade. A fall of 450 feet in 1400 is not sufficient to keep rock moving in a slide way. The amount of shovel assistance required would make it very costly of operation. Probably the cheapest and readiest solution of the problem would be the wagon road, which would in this case save a rehandling of the ore at the top of the slope to the mill.

ALL modern gas engines belong either to the 4-cycle or 2-cycle class. In 4-cycle engines the sequence of operations takes four strokes, or two complete revolutions, before it repeats itself. First, the piston moves out, drawing in a charge of mixed gas and air at atmospheric pressure. On its return stroke it compresses this charge into the clearance space. Then the ignition takes place, and the pressure and temperature suddenly rise, and the piston moves rapidly forward, expanding the burning gases. At the end of this stroke the exhaust valve opens, and then the piston returns, driving out the burned gases and making ready for a repetition of the cycle. This necessity of taking two complete revolutions per cylinder per charge has led to the devising of the 2-cycle engine. In it the mixture is partially compressed by means of an auxiliary blower, or cylinder, and is made to drive out the burned gases while the piston is at its out dead center. Then the valves close and the piston compresses the charge into the clearance space. Explosion and expansion ensue, as before, and the new charge again drives out the exhaust gases. This cycle has the advantage of more frequent explosions, but it is sometimes more difficult of successful operation on account of the possibility of turning in too much mixture and losing part unburned in the exhaust, and also the difficulty in cooling sufficiently to prevent the new charge from becoming ignited by the preceding one.

TO DETERMINE the percentage of copper in the ore one way would be as follows: Five grams of the finely powdered sample are roasted to eliminate the sulphur, adding and mixing in a little carbonate of ammonia towards the close. Dissolve the roasted product in a casserole (covered with a watch glass) by adding 5 c. c. of hydrochloric acid, 10 of nitric acid, and 10 of sulphuric. Boil slowly, nearly to dryness, until nothing but dense white H_2SO_4 fumes arise, then cool, dilute with a little water and digest. Filter, and wash thoroughly the residue which is then rejected, the copper being now present as a sulphate in the solution, which is transferred to a porcelain dish. A small piece of pure metallic zinc, resting on an accurately weighed platinum foil, is introduced into the solution. Zinc has a stronger attraction for the sulphuric acid radical (SO_4), than copper does, and so the former displaces the latter from its salt and it collects on and around the platinum foil as metallic copper. The action should be made to take place fairly rapidly by the addition of dilute H_2SO_4, until all the zinc is dissolved, at which time all copper should be deposited, and the solution should be clear and show no dark color with H_2S water. It is then poured off, the metallic copper and platinum foil are both washed with water and alcohol, dried and weighed, which, less the former weight of the foil, would indicate the amount of copper per 5 grams of ore. Suppose it to be 1.06 grams, then the percentage of copper would equal $1.06 \div 5 = .212 = 21.2\%$, and the ore would yield $2000 \times .212 = 424$ pounds of metallic copper per ton of 2000 pounds.

SECTION 4886, Chapter 126, U. S. Revised Statutes, provides that any person who has invented or discovered any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement thereon, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country from his invention and description thereof (and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been patented) may, upon payment of the fees required by law and other due proceedings had, obtain a patent therefor. Under this section of the Revised Statutes it has been held that, in order that a prior publication may defeat a subsequent application, the publication must be, first, a work of public character intended for general use; second, within the reach of the public; third, published before the date of the latter invention; fourth, a description of the same complete and operative art or instrument; fifth, so precise and particular that any person skilled in the art to which the invention belongs can construct and operate it without experiments and without further exercise of inventive skill. It has also been held that a written but unprinted description is not a publication; that a drawing or tinting without printed text is not a publication; that business circulars that are sent only to persons engaged or supposed to be engaged in the trade are not such publication as are contemplated by the section referred to. It was held, however, in another case that a journal devoted to a special science, printed in German and deposited in the library of the patent office and in the library of the Institute of Civil Engineers—a society of 3000 members and there accessible to them—and catalogued under the head of "Journals" only, though proved to have been read but by one person, is a sufficient publication.

Water Purification for Domestic Use.

Written for the MINING AND SCIENTIFIC PRESS by
F. RIGAUD, C. E.

The requirements as to quality are widely different between water desired for industrial purposes and water for domestic use. To know if a given water satisfies technical requirements for industrial purposes a chemical analysis is made. Difficulties of use arise from the presence of calcium carbonate and sulphate, rarely from other saline substances, such as sodium chloride or sulphur. All of these minerals are easily detected by the chemical analysis, which is also more or less suggestive of the means to be taken to obviate the difficulty.

Sodium chloride—common salt—cannot be got rid of, but is not of much consequence when in small quantity, for either domestic or most industrial uses. It, however, makes water unsuitable for brewery and some chemical fabrication uses. Sulphate of sodium can be changed to sodium chloride by adding to the water a proper quantity of calcium chloride, provided it is desirable to avoid the presence of the calcium sulphate.

Carbonate of calcium is easily removed, good aeration effecting it, the water after aerating by a convenient fall in the open air being allowed to settle still in a reservoir. The calcium carbonate, having been deprived of its carbonic acid, sinks with suspended clay, sand and other mechanical impurities. Some calcium sulphate, if present, will also be deposited, but not all there may be in the water.

When necessary, it is possible to take out the calcium of calcium sulphate by adding a proper amount of sodium carbonate, and the free sulphuric acid by the addition of barium chloride. This process may be useful when water is intended for use in steam engines, because calcium salts give hard deposits in boilers and are the cause of dangerous explosions. In this process some sodium chloride remains in the water and for several purposes the inconvenience is not much diminished. Perhaps a better result may be obtained by using, with proper care, barium soluble aluminate, which is claimed to precipitate together lime and sulphuric acid; but the reaction is costly and the process requires too long a time.

Sulphur, or sulphuretted hydrogen, or calcium and sodium sulphides, disappear easily by aeration, being transformed into sulphates. From the above it results that the first and most useful process to render water proper for industrial purposes is aeration by fall, with settlement in large ponds or reservoirs for a sufficient time.

In some places the water supply for domestic service is divided into two distinct parts, on one side water for bathing, washing, cleansing and irrigation, no special condition of purity being required for such purposes, and the water, if necessary, can have added to it antiseptics, phenols or its fellows (except for garden watering). But for the second part, or the whole supply, when there is no separate service distribution from which the people can take their drinking water and water used for ice making, other examinations and conditions are to be met and provided for.

The aim of these examinations is double. In the first line the chemical analysis may exclude absolutely the proposed water. Such is the case if it contains the maximum dissolved sulphate of calcium—two parts in one thousand—or a similar amount of magnesium sulphate, or a notable amount of sodium sulphate, or an excess of sodium or calcium chloride. In each of these cases the presence of these substances in small quantities—about one-half part in one thousand—is not sufficient reason to reject the water. But the several minerals noted above must be considered as cumulative in their noxious effects. Sodium chloride, when not above one to one thousand, is more advantageous than noxious to taste and for health.

In case other substances are present, such as, perhaps, arsenic, sulphur, etc., the analytical chemist may indicate if it is possible to remove them by a simple process without danger to the public health. Otherwise the proposed water is to be rejected. Naturally, in all cases water cannot be clear, and, except when coming from perfect springs, it must be aerated and settled in ponds or reservoirs. Here in the second line of examination begins the work of the hygienist and microbiologist. Water is to be examined with the aid of the microscope for microbian culture by a very competent specialist; and this examination must take place not at springs or reservoirs, but after arriving at the place of use, because the rest in passage in pipes, ponds, reservoirs and basins is an opportunity to raise high the number of microbes in a given quantity of water, and the question is to have pure water, not 10 miles from the city, but at hand for the drinker or ice maker.

In current circumstances the microscope reveals the presence of numerous microbes or colonies, but the specialist is able to distinguish between noxious and non-noxious bacilli, and if he does not find anything other than common and inoffensive ones he may declare the water to be acceptable without danger to the public health.

This conclusion generally is a dangerous fallacy. The chemist has no right to declare a water supply not dangerous except when the microbes are very scarce. If microbes are numerous in water, although not dangerous when observed, they prepare by their presence a fertile field, a true bouillon of culture, for dangerous microbes in the atmosphere, so that, however ordinarily without dangerous microbes, a microbous water, in time of epidemic, is a sure vehicle for the extension of the epidemic.

The condition is especially dangerous when the point of consumption is a seaport, into which from all parts of the world the microbes of epidemics come.

We must add to this that other considerations than material purity of water are to be taken into account. Water must be agreeable to the taste, and the public are interested in securing the delivery of such water, and not of an insipid and nauseous kind. With disagreeable water, there is an inducement to use alcoholic beverages, separately or mixed with water.

This question of taste is the principal reason for aerating water supplies; but aerating water is quite insufficient when water is microbous, and aeration does not kill the microbes, or, if they are partially killed, they are not destroyed, and the water remains insipid.

From these premises it appears a duty of public or local authorities to control the quality of water by insuring that water is clear and without microbes at entrance into the delivery pipes, in which it will be free from contact with the open air till tapped by the consumer.

If connection cannot be made with pure springs, it is necessary to make water absolutely clear and to deprive it of microbes at its entrance to local delivery. Sterilization of water may be accomplished by boiling it a few minutes, but it is not possible to insure the killing of all the microbes if the temperature does not greatly exceed 100° C., or 212° F. Several microbes resist a temperature up to 110° C. However, the boiling of water before drinking is a good precaution in time of epidemic, at least in a low country. On mountains the boiling temperature is not high enough, being 1° C. lower for each 27 millimeters of atmospheric pressure. Epidemics are, however, rare in mountainous countries, excepting dysentery. If there is something to fear, it is best on plains and mountains alike to boil water with antiseptic matter, and especially with tannic and perfumed ones, tea or coffee. To the habit of drinking tea must be attributed the scarcity of epidemics in China.

This sterilization of water is an individual question, and not to be attempted by the general public. The same is the case with the use of alcohol. Thus whiskey is a good antiseptic, and by mixing it with pure water, in the proportion of one to four, there remains no great chance of taking an epidemic disease from drinking water.

Another plan has been to sterilize water by adding to water in a vessel a small quantity of calcium permanganate, just enough to see a light red tint. In a few minutes all microbes are killed and burned by the excess of oxygen in the permanganate, and excess of permanganate, if very small, disappears quickly by natural destruction. But such a process for purifying water for drinking is too dangerous for general use.

Chlorine as a gas or in solution may be used and is a perfect destroyer of microbes, but makes water very disagreeable if there remains the least speck of free chlorine, or of its combination with sodium and calcium. Probably the use of chlorine would not be quite as dangerous as the permanganate, but neither is to be recommended.

As a general conclusion we must say that, except by boiling, by mixing with alcohol, or by infusion with tea, coffee or other aromatic and tannic leaves, we do not know of any way to realize perfect sterilization of water in small quantities except by ozone.

We arrive now at the ozone process. Ozone is nothing more than oxygen, the ordinary agent of animal life, but enjoying very active oxidizing faculties, because of certain molecular or electrical modifications.

As soon as ozone is put in contact with organic substances, such as microbes, it burns them completely up, giving in their place a very slight amount of carbonic acid. And if an excess of ozone is used, it disappears very readily by itself, ozone being unstable.

In the last ten years numerous experiments have been made by physicians, chemists and biologists on this question of ozonization of impure water, as well on a small scale in laboratories as by large quantities for water supply in considerable cities. The results obtained are perfectly verified and may not be contested; and because I took part in several of the most important of these experiments I am able to explain the method and the results.

One interesting feature of ozonization is the economy of its use on any scale, not, however, in the same way. When applied in small quantities the process is to use ozone-gasified water. This liquid, for our purpose, may be considered a solution of ozone in ordinary water. It is commercially furnished with about 3% of pure oxygenated water, in weight; but it is necessary to compare it to ozonized air in order to examine its effect, and a gallon of commercial ozonized water is equivalent to 2500 gallons of air ozonized at the rate of ½%—one gallon of ozonized air being sufficient to sterilize about ten gallons of impure water in an ordinary cooling chamber, and one gallon of commercial oxygenated water to treat 25,000 gallons of impure water.

The sole precaution to take in the use of this process of sterilization is to have a good mixture of the sterilizing liquor with the flow of water, and that is easy to obtain.

We take a Mariotte (or sypoide) vessel as regulator for dropping the oxygenated water, and we put the tube of this vessel in the flow of water arriving from a pipe in the last reservoir before distribution. The discharge of water being known, we regulate the pressure in the Mariotte apparatus in order to produce the required proportion of 1 to 25,000 and thereafter there is nothing more to do except to exactly supply the Mariotte. When this operation is begun it is necessary to verify by bacteriologic examination that we have adopted the proper proportion. This at the beginning is probably too short, and leaves part of the bacteria. It will be increased according to observation until the water going out from the reservoir presents only a small number, say 400 or 500 to the cubic inch, and all of the harmless kind, known by bacteriologists by the name Henbacillus. This number seems high, but the ordinary number of bacilli colonies is 30,000 or 40,000 per cubic inch. The sterilization down to 1% is comparable to the best practical industries of any kind. The difficulty may be to be supplied with clean oxygenated water, free of barium and containing a regular quantity of ozone.

When the question of sterilization arises for a city the use of dissolved ozone cannot be considered. It is much cheaper and better to make ozone in place and to utilize it immediately. The tests I made were on a large scale, treating daily 2,500,000 gallons. If there is a much larger quantity of water to sterilize daily, the same ensemble of apparatus can be reproduced as many times as there are 2,500,000 gallons to be treated daily, except, of course, the steam and power plant. A reduced disposition may be adopted for 1,000,000 gallons daily, but the expenses increase notably. Therefore I take for basis of treatment 2,500,000 gallons daily.

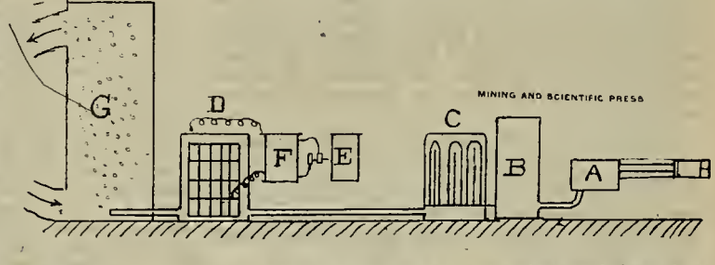
Since I made the experiments referred to, the ozone process has been put into use in several cities. Certain differences exist between the apparatus established in these different places, and certain improvements resulted from these operations. But the main points are well established and the results of practice have been perfect in every case, the difference being only in the cost of treatment.

The following is a description of the operation and scheme of its organization: It is necessary to use fresh cold air. In case it should be impossible to obtain air below 60° F., it is necessary to cool the flow of air before its ozonization by passing it through pipes inclosed in ice or by refrigeration by some process.

The water must be under about one-half atmospheric pressure and the purification must take place under this pressure. The air is deprived of moisture by caustic alkali. In the accompanying diagram A is the air compressor, B the drier, C the cooling chamber.

The quantity of air to pass into the ozonator D is about one gallon to ten gallons of water to be treated, or 33,000 cubic feet daily, in our type—385 cubic feet per second, under pressure of 20 inches of mercury.

The ozonator may be constructed on several plans, the principle alone being fixed. It contains a large number of small cells, each of which is formed by two



surfaces of glass. The exterior sides of their surfaces (plates or cylindrical) are covered with metal—tin or copper—or are in contact with pieces of iron, and the surfaces respectively are connected by wires with the two poles of an electrical alternator E and transformer F, giving at least 40,000 volts pressure. The electrical engine furnishing electric current for our type is a 30 H. P., producing daily about fourteen pounds of pure ozone.

Between the surfaces of glass runs slowly the air sent by the compressor, and it acquires about ½% of pure ozone as a result of this indirect electrization. Then the air goes directly to a tower G, or, more exactly, three or four towers (about 15 feet high), whose diameter is calculated to provide fifteen seconds

for the water to pass through. The aim of this disposition is to assure perfect mixture of ozonized air at ½% ozone with water during fifteen seconds.

The variables in the operation are the amount of air furnished and the number of turns at the electric engine. Regulation is made by accurate bacteriologic examination of water flowing from the tower. The indications we have given above appear like a maximum, except in extraordinarily impure and dangerous water.

The result is absolutely perfect and marvelous. Examination of water arriving at the aerator, in the experiment to which I refer, gave about 60,000 bacilli colonies to the cubic inch. After fifteen seconds mixture it was not always easy to find any microbes, but the estimation was twenty or thirty, all non-noxious.

On the other hand, when taking water in a pipe 6 feet long, terminated by two glass plates, it was difficult to see light through the water arriving. After treatment the transparence was complete; and, tasting the two kinds of water, I found a big difference. The first one was insipid, the second very agreeable to drink. And this experiment is not the least one, because the taste is a better analyzer than some chemists and scales.

From the experiments I made, and confirmed by other observations, the plant for this operation will cost about $20,000 for the type treating 2,500,000 gallons of water daily.

The necessary current expenses are the cost of running an engine of 25 to 30 H. P. and the maintenance of all apparatus in perfect shape. From our experiments the direct expense was 1 cent for 5000 gallons, or $5 daily for the 2,500,000 gallons. The cost of maintenance for the $20,000 plant may be not far from the same figure; but for general expenses it is difficult to foresee everything without knowing the special indications. If the purification is connected with pumping, the general expenses will be low, the salary of an engineer only; but if the operation is separate the cost may be very high. I think as a provisional figure, under various circumstances, the price may be between 2 and 5 cents to 5000 gallons; but the above figure, applied with care, allows any one to make an exact estimate in given circumstances.

The important point is constantly made that air at ½% ozone, in contact during fifteen seconds with impure water, transforms this liquid into a perfect beverage.

Quality of Stone Used for Concrete.

The use of concrete is increasing so rapidly at the present day as to render a consideration of the quality of stone best adapted for the purpose of more than passing interest. In discussing the influence upon the strength of concrete of different varieties of stone, the Quarry says:

It appears from experiments which have been carried out in the testing shops of the Royal Technical High School in Stockholm that all kinds of broken stone are by no means of equal value for making concrete. These experiments did not include the examination of the different results obtained from crushed stone and from shingle, which is very largely used for concrete in the neighborhood of shingle beaches, but rather of the different results obtainable from various kinds of crushed stone which might reasonably have been supposed likely to be of uniform value for this purpose. All the stone upon which experiments were made was crushed in an ordinary stone breaker to a uniform gauge, and a number of 10-inch cubes, made of cement, sand and broken stone, in the proportion of 1, 3, 5, were molded and rammed, with the addition of 5½% of water. Both the sand and broken stone were carefully dried and washed before mixing. The ramming was done by forty-four blows of a monkey, weighing 130 pounds, with a fall of 3.28 feet, this being about one-quarter of the work put on standard test pieces of cement. The blocks were kept for a fortnight covered with soaked mats in a damp cellar, and afterward in a dry, cool room until the completion of a month from the time of mixing. The mean results of five separate tests of blocks made from five kinds of stone gave the following figures:

Kind of Stone.	Weight of Concrete per Cubic Yard. Tons.	Crushing Strength per Sq. In. Tons.	Relative Crushing Strength.
Hornblendic granite	1.79	1.125	100
Diorite (greenstone)	1.79	0.965	86
Hornblendic granite from Rindo redoubt	1.74	0.958	85
Pegmatite, from Edholmen	1.72	0.894	79
Pegmatite, from Ytterby	1.70	0.685	61

Individually the five specimens of greenstone concrete showed the greatest variation both in weight and crushing strength. The strongest was more than half as strong again as the weakest, although the weight per cubic yard did not differ by more than 4.4%. This important result points to the great necessity of ramming in order to secure the greatest possible density. The relative strengths given by the different kinds of stone in the above table also show great differences. Between the two kinds of hornblendic granite, for example, there is a difference of 15%, the only difference observable in the stone being that the weaker specimen was of coarser grain. The pegmatites, which gave the poorest results, were also coarser in grain than the other varieties.

The structure of the stone employed for concrete appears, therefore, to play a most important part in determining its strength, and coarseness of grain is not a desirable quality. To this fact we call the attention of all engineers and concrete manufacturers, for it is obvious that not all kinds of crushed stone are capable of giving the best results.

The Stave and Binder Flume.*

Written for the MINING AND SCIENTIFIC PRESS by GUY STERLING, C. E. and M. E.

Successive years of water scarcity throughout the West have induced engineers and others, who are interested in the handling and conservation of water, to give careful consideration to the improvement of some of the older methods of hydraulic construction. In proportion as the more easily available sources of water are appropriated, will the future development of water supply tax the ingenuity of the engineer to design safe, permanent and economical works for the diversion of water and its conveyance over difficult routes and through long distances to the place of use.

In spite of its makeshift character, its many faults and inherent weaknesses, no design for any form of open-topped conduit has been made for conveying water on a grade line along steep mountain sides, so cheap in first cost, so easily and quickly built and so readily adaptable to a wide range of conditions and services, as the all-wood box flume. Any form of structure which retains the chief advantages of the box flume and is at the same time free from many of its objectionable features will be of interest to engineers and users of water in general.

In the round-sided stave and binder flume (patented) the writer believes that a type of flume has been designed which is entirely free from the faults objectionable in the box flume. In the round-sided flume the materials—wood and iron or steel—are combined in an economical and self-contained manner for the purpose in view. This flume may be described as a round-sided, or semi-circular or partially round-sided, open-topped conduit, composed of staves and tie beams, the latter spanning the top of the conduit, and binding rods or bands which pass around the staves and through the ends of the tie beams and are adapted to bind the whole firmly and tightly together. In Fig. 1 is shown a view of the flume, which clearly illustrates the mode of construction, which is more like that of a wooden stave pipe than a box flume. Under comparable conditions, whatever advantages or disadvantages pertain to the wooden stave pipe would seem to pertain with equal force to the semi-circular flume.

Of this round-sided flume about 6 miles have been built, all of which is in successful operation. Two miles were built in 1892, 1½ miles in 1895 and the remainder in 1896 and 1897. The two first mentioned were built of redwood staves and for irrigation purposes; the other flumes of this type were built of Oregon fir staves.

With one exception, these flumes were allowed to stand for long periods of time in a perfectly dry condition, with no care or attention of any kind; nevertheless, the work of clinching up the bands and rounding out the staves, which work put the flumes in first-class condition, cost only 4 cents per lineal foot of flume. Whenever this type of flume has been used in a normal manner, the total cost of maintenance, operation and repairs for flumes of from 15 to 30 square feet area has been less than 2 cents per lineal foot per annum.

In the use of a new type of flume, as might be expected, some defects of design have developed; but these were entirely defects of particular designs, and not of the type. Taken as a whole, the nine years of experience with this flume, under extremely unfavorable and under some favorable conditions, have shown that it meets every requirement of durability, cheapness of maintenance, ease and convenience of repair, water tightness and low first cost.

In the shell or lining of this flume no nails are used; its parts are held in place by the binding action of the tie beams and bands. The flume may be supported by wooden chairs, as illustrated in Fig. 1, or preferably, by iron chairs, as shown in Fig. 2. Where the circumstances will permit, no better support can be devised than earth tamped firmly around the sides, as shown in Fig. 3.

The setting up of the flume is simply made. Two chairs, or outside forms, are set up, and in these the flume staves are laid, with their adjacent ends falling 2 or 3 feet forward or back of each other, thus forming a "stagger" joint. When all the staves required to fill a section are in place, the bands, tie bands and washers are put in place and the nuts on the ends of the bands are turned down, thus binding the staves together. As the bands are drawn tighter and tighter, the staves are rounded out with leather-faced mallets, until the inside of the shell is smooth and the longitudinal seams between the staves are closed. Iron tongues, 1½ inch wide, ⅛ inch thick and a little longer than the stave is wide, are next driven into the grooves cut into the ends of the staves for that purpose. Then another outside form, or chair, is set up and the staves of the next section are put in place, the staves being so held that the tongues already inserted in the ends of the staves of the completed section can enter the grooves, or slots, in the ends of the next section. The joints at the abutting ends of the staves are then closed by by driving up the staves with a wooden driving bar and heavy hammer, by which operation their joints are made water and air tight.

*See illustrations on front page.

Under fair conditions, a well trained crew of two or three men and a foreman will build from 75 feet to 150 feet of flume per day, depending upon the size of the flume and the character of the alignment.

On curved alignment the flume is built straight out on the tangent to the curve and is then bent, as a whole, by special power appliances, to fit the curve. In this manner flumes of 6 feet inside diameter have been bent to curves of 80 feet radius. For such large flumes, however, the radius of curvature should not be less than 200 feet. When curves of shorter radius are unavoidable, the flume can be mitered to fit them.

The best material for staves is California redwood or Washington cedar; when these can not be obtained, Oregon fir or Texas pine can be depended upon for good results. Wood which is free from knots will give the best service, although the so-called "common" grade of Oregon fir has been used for this type of flume and is giving satisfaction.

Owing to the variable conditions controlling the cost of all flumes, it is difficult to make a statement of comparative costs for the box flume and the round-sided flume which will have anything like a general application. The quantities of material required for a flume of each type, the areas being equal, will convey an idea of the comparative costs.

Flumes of 13 square feet area and 16 feet long require, if made in the half-round design just described, for a 16-foot length, 444.5 feet of lumber and 96.91 pounds of metal. The same cross-section of water flow area made in the form of the ordinary box flume will require 646.5 feet of lumber and 10 pounds of metal.

For flumes of about 13 square feet area, the box flume has about 10% less carrying capacity than the round-sided flume by reason of the difference between their respective hydraulic radii. The box flume requires 45% more wood—a perishable material—than the half-round flume. The first cost of the box flume will be about 10% more than that of the round-sided flume. As no nails or screws are used in the lining of the round-sided flume, the flume will be likely to have a long life.

In flumes of greater area than 13 square feet, the difference in the hydraulic radii and the relative quantities of lumber required are more in favor of the round-sided flume than shown above, while for smaller flumes these differences tend to disappear.

The respective fields occupied by flume and pipe conduits seldom overlap, for when it is practicable to carry the water in an open-topped conduit, the flume, on account of its lower first cost, will be preferred; but where water has to be conveyed across deep canyons or around steep cliffs, requiring high and expensive trestles if flumed, the pipe will have the lower costs and some constructive advantages.

Volumetric Determination of Antimony.

The finely crushed sample, ½ to 1 gm., is treated in a beaker with 50 c. c. hot water and 50 c. c. strong HCl, the water being added first. Heat on sand bath at 70° C. for one-half to one hour. Filter in large beaker or flask, washing with dil. HCl and water. Add tartaric acid to filtrate, dilute to about 750 c. c., heat to 70° C., and precipitate with H_2S. Filter, wash with H_2S water, then precipitate back into precipitation vessel with the aid of hot water. The sulphide is warmed with 50 c. c. strong HCl (avoid boiling) until no more H_2S is evolved. The presence of H_2S is at once detected, if a little cold water be added to the solution, by the reappearance of a precipitate of red Sb_2S_3, the addition in the absence of H_2S causing only a slight milkiness, due to basic chloride. When all H_2S is expelled, the liquid is diluted, the turbidity is removed by just sufficient HCl added drop by drop, and the solution titrated with permanganate. $5Sb\,Cl_3 + 16H\,Cl + 2KMnO_4 = 5Sb\,Cl_5 + 2KCl + 2MnCl_2 + 8H_2O$. If 5.27 gms. of $KMnO_4$ be dissolved per liter of solution, 1 c. c. will equal 1% Sb with 1 gm. sample. The end point of reaction is sharply defined.

AN appropriation of $60,000 has been made by Congress for the investigation of the mineral resources of Alaska by the Geological Survey. One of the parties has for its objective point the base of Mount McKinley, the highest mountain in North America, and which, so far as any record shows, has never been viewed except from a distance. The party will explore the northern slope of the Alaskan range, making such expeditions into the mountainous regions as is possible, and so mapping the country that future expeditions will find a broken trail. It will be under the direct supervision of A. H. Brooks, and will leave Seattle, Wash., about May 15, going by steamer to Tyonok, on Cook Inlet. D. L. Raeburn will be topographer, and five camp hands, with a pack train of twenty horses to carry the outfit, will make up the party.

Placer Mining Kinks.

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS by CHAS. P. RICHARDSON.

UNDERCURRENTS. — For saving fine, rusty and "black" gold and floured amalgam I screen my material through a grizzly made of twenty to twenty-four bars ¾x2x30-inch tire steel, set on edge across the 30-inch flume with ½-inch interstices between the bars, the top of the bars set ½ inch below the level of the riffle blocks when new. The screened material passing through the grizzly falls through a 24x18-inch hole cut in the bottom of the grizzly box into the head box, 20 inches wide, 24 inches deep, set below and at right angles to the main flume. This box, set on 6 inches grade to 12 inches, leads the material to the head of the undercurrent tables, and it is there distributed to the tables by gates hung at right angles across the head box, from a slotted frame resting on the top of the box. (See Figs. 5, 6 and 7.) I cut the gates with a narrow top so that by reversing them in the slots they can be adjusted to cover the whole width of the head box. There is no side board to the head box on the side toward the tables, after the head box joins the top of the tables. The tendency of the impetus is to drive all the material to the far end of the head box and consequently onto the last table. (See cut.) To counteract this tendency the distributors are set to divert the material, and they need to be stoutly made, too, it being well to set the slot frame guides A and B (Figs. 5, 6 and 7) below and above the supporting frame C, as shown, to better resist the impact of the water and prevent its prying guide A off the frame.

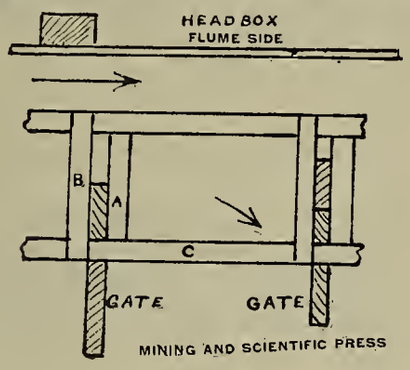


FIG. 5.

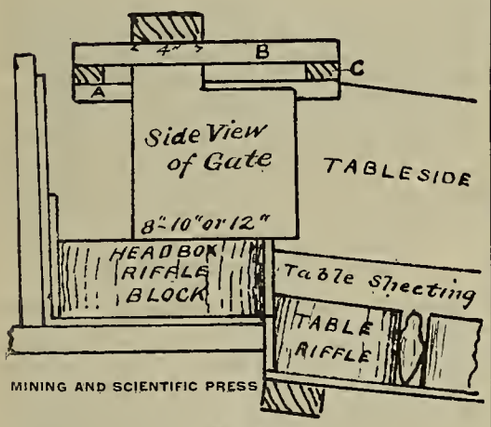


FIG. 6.

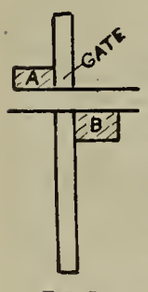


FIG. 7.

The undercurrent tables, set parallel to main flume, are 10 feet wide, 24 feet long, on my upper flume, and 7½ feet wide, 36 feet long on my lower flume, are each divided into three compartments longitudinally and are set on a grade of 15 inches to 12 feet. I use two or three distributors to each compartment to flow the material evenly over the whole riffle surface. I use a block riffle spaced up and down the tables about 2 inches apart and chinked with boulders. I formerly used round blocks, but now square and split them to form a better cross riffle.

I give the grizzly box a 10-inch grade and the tail boxes below the grizzly 15 inches grade to 12 feet as against 6½ inches above the grizzly box. Below the grizzly I square the blocks carefully on four sides and set the sides tight against each other and the flume sides with no interstices. This forms a perfectly smooth surfaced pavement which with the increased grade effects a proper delivery of the coarse material through the tail boxes to the dump, without any stoppage arising from the reduction of the water flow at the grizzly.

The material from the grizzly dropping 2 feet into the head box tended to form dead water and a boil, resulting in the blocking of the head box with the sand and gravel sent down. The 6-inch grade on the head box is ample, even a trifle heavier than necessary to handle my class of fines after they are in motion. To prevent the boil and start the fines down the head box I cut the two blocks under the grizzly with a sloping surface, as shown in Fig. 4, which gave them 5 inches grade in 30 inches. This ended the boil and the inertia difficulty.

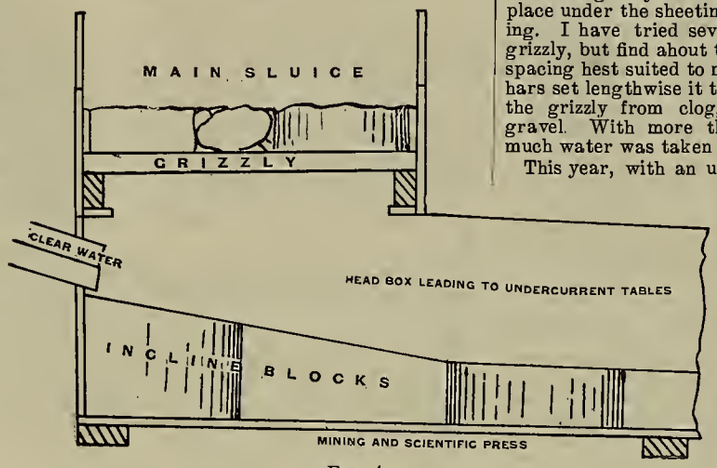


FIG. 4.

In running very sandy ground which resulted in a great quantity of fines, and also in the "sand padding" of the riffles and consequent inclination of fine gold to travel excessively, I found it necessary to supply additional clear water to keep the riffles clear on the tables. I tapped my ditch and brought clear water down in an old string of 6-inch hydraulic pipe and delivered it in the head box, as shown in Fig. 4.

I have used, up to this season, a 10x24-foot undercurrent table modeled in a general way after the North Bloomfield table as described by Bowie, divided into three longitudinal compartments. This year I installed a second table on my lower flume.

Undercurrent on Hydraulic Sluice.

This I made up of three independent lines of 30-inch sluice boxes set side by side, with the head box and distributors as described above. I like the idea much better than the one broad table, as it permits the lengthening or changing in any way desirable of one of the tables without the necessity for shutting down the whole undercurrent, and makes it easy to experiment as to grades, etc., on a portion of the tables. My grizzly bars are of tire steel because it is easy to obtain at general stores in my vicinity. I presume a chilled cast bar or hardened steel would wear longer and would be improved with a wedge-shaped cross section, giving freer passage of gravel through the grizzly. I formerly used ¾x3½-inch bar, but found that one season's wear on each edge and side cut them down so in the middle that their usefulness is past, so the ¾x2-inch serves just as well. I rest the bar ends on two pieces of scantling 3x4½ inches set on edge lengthwise on each side of the flume, and space the bars with wooden blocks 2x3x½ inches set on edge on the scantlings.

In setting the grizzly I first lay the pavement to the upper side of the grizzly, and wedge it up so that the carefully squared riffle blocks on the upper side of the first bar are tight and true against the bar and each other, wherefore there is no chance for sand to wash down between and cut out a hole to let coarse material through. Then I lay the bars and spacing blocks. Finally, the pavement below the grizzly being laid, the last two riffle blocks—likewise carefully squared—are placed against the grizzly from below and then wedged up tight against it by driving wedges between those blocks and the pavement below. Don't drive your wedges between the last two blocks and the grizzly. This wedging up holds the grizzly bars and spacing blocks firmly in place under the sheeting with no additional fastening. I have tried several ways of setting up the grizzly, but find about twenty cross bars and ½-inch spacing best suited to my material and water. With bars set lengthwise it took one man's time to keep the grizzly from clogging with roots, grass and gravel. With more than about twenty bars too much water was taken from the tail flume.

This year, with an upper flume 120 feet long—on 6½ inches grade to 12 feet—above the undercurrent grizzly, discharging into 400 feet of bedrock race which discharged at 100 feet lower into a lower flume 120 feet long—on 7 inches grade to 12 feet—above the undercurrent grizzly, as my flume equipment, I saved 13% of my values on the undercurrents. So large a percentage of savings on the undercurrents is due to my opening a new pit, now 120 feet deep, which had to be attacked at this point from on top, and my working consequently a large proportion of top and sandy ground containing light and somewhat flaky gold, which of course travels long distances in the sluices. On another deposit on this property, with 840 feet of sluices in ahead of the undercurrent, my saving on the latter was about 2% of the values recovered.

RETORTING WITH A POT RETORT ON A BLACKSMITH'S FORGE.—My understanding of a proper retorting fire is one diffusing a moderate heat over a distributed area, one under easy control of the operator and, preferably, one heating the retort first at the top. A blacksmith's forge fire gives an intense heat over a restricted area, and that restricted area at the bottom of any body so large as a retort placed upon it.

With a little adaptation the forge can be transformed into a very satisfactory retorting agency for use on small or poorly equipped properties, or those in the development stage, for use with retorts up to five or six-pint capacity. Bend a piece of sheet iron, 12 to 15 inches wide, around three sides of a box large enough so that with the retort hung within there will be 3 or 4 inches of space between it and the sides of the sheet iron jacket which this is to form. (See Figs. 8 and 9.) Stand this jacket on the forge hearth over the tuyeres so that the forge back will form the fourth side of the square which—to mix geometry and Irish—has neither top nor bottom. In this hollow square swing the retort by hooks attached to chains or strong wires depending from overhead, the hooks engaging the retort hale, keeping the retort bottom 6 inches or so above the "duck's nest."

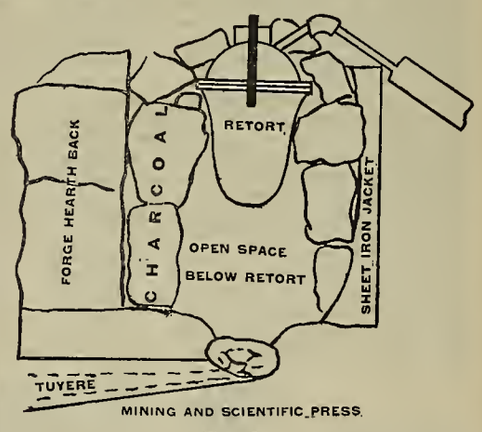


FIG. 8.

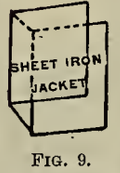


FIG. 9.

In the absence of sheet iron build up your hollow square of rocks or clay, or even thoroughly soaked boards.

Then, after building a small fire in the duck's nest, build up a wall of pieces of charcoal 5 or 6 inches in diameter around the retort in the hollow square, putting no charcoal under the retort bottom, and

piling the fuel up until the top of the retort is covered with smaller pieces. (See Fig. 8.) By using the large chunks of charcoal to build with at the bottom it is possible to maintain the hollow under the retort bottom until the retorting is nearly completed. After the fuel is arranged, using the bellows briskly, the fire is communicated to the whole of the charcoal. Then with a jet of water, handily formed from a tin can with a nail hole in the bottom, wet down and extinquish, or nearly so, all of the fire below the lower part of the retort. You then have a gentle heat distributed over the upper half of the retort, and capable of being maintained or increased by moderate use of the bellows, and diminished by the water jet.

Heating the retort very gradually, and taking care to keep the fire at the bottom of the retort under control by the water jet, the quicksilver commences to distill over with no perceptible "boiling," no rushes and no spurts to carry amalgam over into the condenser.

After the distillation is under way allow the fire to work down into the bottom fuel, which gradually collapses and collects under the bottom of the retort. Keeping fresh fuel piled around the retort the distillation is completed with the whole retort at a low red heat. By building the fire with the hollow under the retort bottom, and with proper use of bellows and water can, the tendency of the forge to get a high heat on the bottom of the retort is avoided, and a very satisfactory retorting furnace obtained.

I never place the end of the iron condenser tube under the surface of the water in the quicksilver receptacle. Instead I wind two or three thicknesses of cloth around the end of the tube, forming a cloth tube, which I allow to hang in the water. The cloth tube being collapsible and somewhat pervious to the passage of air, forms a sort of safety and air valve as it were, so that in case of puffs or "snorts" in the retorting of foul amalgam or a sudden and violent boiling over of quicksilver followed by a subsidence, causing a partial vacuum in the retort, there will be no danger of water being sucked back up the condenser tube into the redhot retort to create explosions.

My three-pint retort two-thirds full of my amalgam contains about $1500. I put it in as loosely as convenient, after luting the retort interior with a paste of ground chalk and water, and remove it by dumping the retort in a gold pan as soon as possible after distillation is complete, before the sponge has a chance to cool.

PANNING AMALGAM.—In panning the foreign substances out of my amalgam for retorting after a clean-up, I find the sooner the amalgam is panned the easier the process is. Finishing a clean-up at 5 o'clock in the afternoon, I have panned clean of black sand, tacks, nails, etc., in two hours, $2900 in amalgam.

Left to stand over a couple of nights in the clean-up bucket, $1600 of similar amalgam has kept me busy for half a day. Lying in still water and quicksilver and in a large mass the amalgam loses much of its coherence, and is much harder to pour dry than the freshly picked up amalgam. Under agitation in the pan it breaks into small independent masses erratically, forming a rough and creviced surface to the "pat" in the pan, which allows the black sand, etc., to settle in the cracks and irregularities of the surface. Consequently the sluicing action of water fails to reach and carry them out without tedious effort and skillful manipulation.

The fine gold in my diggings—mostly from the upper portions of the banks, presumably—that runs down into the sluices for the first of the season's clean-ups, runs better than $19 per ounce; that from the bedrock cleanings a little over $18. The space occupied by $100 of the fine gold amalgam would contain $145 to $170 of the bedrock cleaning's gold.

(TO BE CONTINUED.)

Ancient Workings of Kougarok, Alaska.

Evidence has been found which seems to establish the fact that the mines in the Kougarok district were worked many years ago. A cofferdam built of rock has been found on No. 3, Gold Run, similar to the one on No. 8, and a bedrock drain 500 feet long has been uncovered on No. 14. Within the confines of the cofferdams the bedrock yielded no gold, while on claim No. 14 on the bedrock of the drain little or no gold has been taken out.

These discoveries were made at a considerable depth from the surface. The walls of the drain can be traced distinctly for a distance of 500 feet, and show every indication that the stones of the wall were placed one upon the other by human hands. Those who have given the matter close study say the mines were probably worked by the Russians while Alaska was under lease to the Russian Fur Company. During that lease the fur company made it a crime to mine within the limits of Alaska, and even when hunters brought in gold-bearing quartz they were given from fifty to one hundred lashes. The Kougarok district was out of the range of the officials, and the mines were undoubtedly worked clandestinely.

Friction.

As pointed out by Engineering, one is sometimes inclined to look upon friction as a needless retarding element in nearly all machines, and this is not far from right in so far as the opposition to motion is concerned in the bearings of an engine, the piston, crosshead, valves, shaft and stuffing boxes. It is friction that causes hot boxes and cutting at the bearings and requires the production of from 25% to 40% more power in driving a factory or mill than is actually utilized in the finished products. It is friction that resists the efforts of the locomotive to start a train and tends to stop the movement of vessels passing through the water. But with all its disadvantages and wastefulness we could not possibly get along without friction. While it retards motion with considerable loss, its retarding influence is accompanied by a substantial gain—in fact, we could not run machinery without it. It is only by the aid of friction that a belt is made to turn the pulley, or the pulley to drive the belt. It is by friction that a locomotive is enabled to start a train. This may be proved by placing a small quantity of oil on the rails. As soon as the driving wheels reach the lubricant, which reduces the friction, the drivers will fly around at a very rapid rate and until the wheel reaches the clean rail or the steam is shut off. The friction clutch, one of the most convenient appliances used in the transmission of power, would not accomplish what it does without this wasteful, yet necessary, element. It would be a very difficult matter to stop a train of cars, or even a single car, if there were no friction between the tread of the wheel and the brake shoe, and between the wheel and the rail.

There are three important facts or laws to be remembered concerning friction and which everyone having anything to do with the operation of machinery ought to understand:

First, that friction is independent of the extent of the surfaces in contact.

Second, that it is practically independent of the velocity where there is sliding motion.

Third, that it varies with the pressure when the materials of the surfaces remain the same.

From what has been said concerning the necessity of friction it will be apparent that friction is the resistance which a body meets with from the surfaces with which it comes in contact. Friction is usually designated as a certain percentage of the weight of the body, or the pressure it exerts, and this percentage is called a coefficient and is merely a number which, when multiplied by the pressure, gives the amount of friction.

Suppose the coefficient of friction between two bodies is .02, or $\frac{2}{100}$; this means that it will require a pull of .02 of a pound for each pound weight, or the pressure produced on the supporting body, so that by multiplying the pressure, or weight—which is practically the same thing—by .02 we obtain the resistance due to friction.

These numbers or coefficients are obtained by experiment by placing two bodies of given materials in

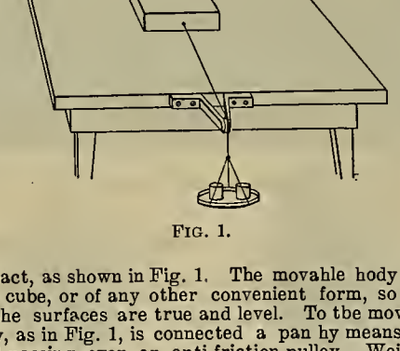


FIG. 1.

contact, as shown in Fig. 1. The movable body may be a cube, or of any other convenient form, so long as the surfaces are true and level. To the movable body, as in Fig. 1, is connected a pan by means of a cord passing over an anti-friction pulley. Weights are then placed in the pan until the body begins to move, which shows that the friction between the surfaces has been overcome. The weight in the pan is then divided by the weight of the block or cube—that is, the body which has been moved. Rolling friction is obtained in the same manner. Suppose in Fig. 1 that the block is of metal, say of cast iron, placed on a table of oak, and that the coefficient of friction between cast iron and oak is to be determined. We place weights in the pan until the block just begins to move and find it to be 16 pounds 3.2 ounces, or 16.2 pounds. Now, if this force was sufficient to move a block weighing say 90 pounds, then, according to our rule for finding the coefficient, it would be 16.2÷90=.18. Now, this coefficient means that if the weight of a body of cast iron sliding on oak wood be multiplied by .18 the product will be the force necessary to start it. In this case 90 pounds multiplied by the coefficient .18 will give us the weight in the pan that was required to move it. Suppose you have a casting weighing 1600 pounds and you wish to draw it or slide it along on an oak floor. How much force will be required to move it? The coefficient of friction is say .18 in the case of cast iron on oak. Then the force required is 1600×.18=288 pounds. We are also enabled to estimate the weight of a body when we know the materials of the surfaces, or the coefficient of friction, and the force required to move the body. Suppose the materials are the same as those we have just considered and the force required to move a body was 288 pounds. What did the body weigh? By consulting a table of coefficients of friction we find that between cast iron and oak wood it is .18. Then the weight of the body may be found by dividing the force required to move it by .18. In this case it would be 288÷.18=1600 pounds. This would represent the coefficient of friction between cast iron and oak only. Different materials have different coefficients, and the same materials have different coefficients, depending upon whether the surfaces are smooth or rough, dry or wet, and if wet, what they are moistened with. Different kinds of lubricants will produce different coefficients, depending upon the efficiency of the lubricant. This may be understood by referring to the accompanying tables.

TABLE I.—FRICTION OF REST.

Pressure lbs. per sq. in.	Wrought Iron on Wrought Iron.	Wrought Iron on Cast Iron.	Steel on Cast Iron.	Brass on Cast Iron.
187	.25	.28	.30	.23
224	.27	.29	.33	.22
336	.31	.33	.35	.21
448	.38	.37	.35	.21
560	.41	.37	.36	.23

Friction of rest is measured by the force required to start a body when standing, while the friction of motion is measured by the force required to keep it in motion after having started it.

TABLE II.—FRICTION OF STEEL TIRES SLIDING ON STEEL RAILS.

Speed, miles per hour.	10	15	25	38	45	50
Coefficient of friction...	.110	.087	.080	.051	.047	.040
Adhesion in lbs. per ton of 2240 lbs.....	246	195	179	128	114	90

TABLE III.—FRICTION OF FLAT SURFACES.

Surfaces.	Coefficient of Friction.
Wood on wood, dry	.25 to .5
Wood on wood, soaped	.2 to .04
Metals on oak, dry	.5 to .6
Metals on oak, wet	.24 to .26
Metals on oak, soapy	.2
Metals on elm, dry	.2 to .25
Hemp on oak, dry	.53
Hemp on oak, wet	.33
Leather on oak	.27 to .38
Leather on metals, dry	.56
Leather on metals, wet	.36
Leather on metals, greasy	.23
Leather on metals, oily	.15
Metals on metals, dry	.15 to .2
Metals on metals, wet	.03
Smooth surfaces occasionally greased	.07 to .08
Smooth surfaces continually greased	.05

TABLE IV.—FRICTION OF JOURNALS.

Material.	Unguent.	Lubrication. Intermittent.	Lubrication. Continuous.
Cast iron on cast iron	Oil, lard, tallow	.07 to .08	.03 to .054
	Unctuous & wet	.14	
Cast iron on bronze.	Oil, lard, tallow	.07 to .08	.03 to .054
	Unctuous & wet	.16	
Wrought iron on cast iron	Oil, lard, tallow	.07 to .08	.03 to .054
Wrought iron on bronze	Oil, lard, tallow	.07 to .08	.03 to .054
Bronze on bronze	Olive oil	.10	
	Lard	.09	

TABLE V.—COEFFICIENT OF FRICTION OR JOURNAL WITH OIL BATH.

Lubricant.	Nominal Load in Pounds. 625	520	415	310	205	153	100
Lard oil	.....	.0013	.0016	.0021	.0031	.0039	.0065
Mineral grease	.015	.0018	.0021	.0031	.0051	.0061	.0062
Sperm oil	.....	.....	.0018	.0015	.0022	.0018	.0047
Rape oil	.001	.0014	.0012	.0012	.0019	.005	.0055
Mineral oil	.0013	.0015	.0016	.0019	.0028	.....	.0055
Rape oil, syphon fed	.....	.....	.....	.0062	.0085	....	.0134
Rape oil, fed by pad	.....	.....	.....	.0099	.0091	.....	.0166

The first of the laws previously given states that friction is independent of the extent of the surfaces in contact. As an illustration of this fact take a block of cast iron and place it first flatwise and then on edge, as shown in Figs. 1 and 2. Suppose this

hlock is the size of a common hrick, or 8x4x2 inches, and weighs 18 pounds. In Fig. 1 the pressure per square inch will he 18÷(8x4)=.562 of a pound. The coefficient of friction is .18, or 18%. Then the pull per square inch of surface will be .18 of .562 of a pound, or .562×.18=.101 of a pound, and the pull required to move the hlock will be .101 multiplied by the number of square inches in the hlock (Fig. 1), which is 8×4×.101=3.23 pounds.

Now, in Fig. 2 the pressure per square inch will he

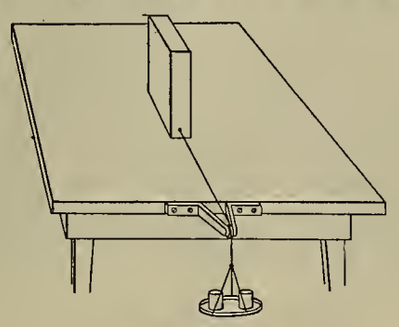


FIG. 2.

18 pounds divided hy 2×8=16 square inches, or 18÷16=1.125, or 1⅛ pounds. The force per square inch of surface necessary to move the hlock will he .18 of 1.125 pounds, or 1.125×.18=.202 of a pound, and the force necessary to move the whole hlock will he equal to .202 multiplied hy the number of square inches in the side or edge of the block in contact (Fig. 2), which is .202×(2x8)=3.23 pounds. From this we see that the extent of surface in any given case has little or no influence upon the amount of friction, and, therefore, upon the force necessary to move a hody. Increasing the number of hearings upon a shaft has no tendency to increase the friction, provided they are in line, for there is a certain weight of shaft to support, and if it is held in two hearings the area in sliding contact will he less, hut the pressure per square inch of surface will be proportionately more than if more bearing surface were used, the same as in the case of the hlock of cast iron. If, however, the pressure is increased to the point where the lubricant can not enter hetween the shaft and the hearing, thus interfering with the proper luhrication of the shaft, the coefficient of friction will he very greatly increased and will then approach that of unluhricated surfaces of the same materials. The pressure per square inch in hearings should not exceed 460 pounds, the surface in round hearings heing taken as the product of diameter and length. As the friction is not increased by adding hearings, and thus increasing the hearing surface, it is advisahle to use a sufficient number to prevent any deflection of the shaft, or sagging due to its own weight, together with that of the pulleys, and the pull of the helts. Sagging will cause the shafts to bind at the ends of the bearings and will require more power to run them. Increasing the length of the hearing or the numher of bearings will have no effect in tending to increase the frictional resistances, hut increasing the distance through which the frictional resistances are to be overcome will increase the work proportionately, for by increasing the hearing surface hy enlarging the diameter we move the point of application farther from the center and increase the leverages of these resistances.

The second law states that friction is independent of velocity. This means that it takes no more power to turn a shaft 10 revolutions when running 250 revolutions per minute than it does to turn it 10 revolutions when running 75 revolutions per minute. In other words, the frictional resistance per revolution does not increase with the number of revolutions per minute; but that due to the atmosphere will, of course, be greater. The amount of pull or force which must be exerted upon a hody—a shaft, for instance—will he found to be the same whether the shaft revolves at a speed of 200 revolutions per minute or at 100 revolutions per minute. But while we are increasing the speed from 100 revolutions to 200 revolutions per minute the amount of force required to turn the shaft will be increased, the amount required per unit of time increasing in proportion to the increase in the speed in the same length of time.

Smelting at Grand Encampment, Wyoming.

The copper matte smelter at Grand Encampment, Wyoming, will he enlarged to a capacity of 600 tons per day, six times its present capacity. The management announces that a converter and refiner will also he added, so that the plant will turn out the pure copper product.

The smelter is owned hy the Boston-Wyoming Smelter, Power & Light Co., and was huilt at a cost of many thousand dollars. The company has made a contract with the Ferris-Haggarty Copper Mining Co. for the entire output of the Rudefeha mine for a period of ten years, commencing with Octoher 1, 1902, and an aerial tramway 16 miles in length is heing constructed by Leschen & Sons of St. Louis to transport the ore from the mine to the smelter. The contract calls for a minimum output of 200 tons of ore daily.

Copper Matte Smelter at Grand Encampment, Wyoming.

The smelter has heen in operation a sufficient length of time to prove its efficiency in handling the ore. Dr. L. D. Godshall is superintendent of the plant, and under his supervision the work has heen carried on with success.

The Grand Encampment copper district is experiencing a hoom this spring, and it is expected that other properties will he worked during the present year.

Grand Encampment, March 22.

The Schilz Cyanide Process at Johannesburg, Transvaal.

This process is carried out hy means of potassium cyanide, harium peroxide, and—Time. In the ordinary cyanide process it is necessary that oxygen be present in some form or other to enable the gold to be dissolved. Various oxidizing media have heen suggested and used, hut Herr Eugene Schilz has introduced a method of supplying this oxygen hy the employment of the higher oxide of harium, which under certain conditions parts with one-half of its oxygen. The process has heen successfully worked at the City and Suhurhan mine since its restarting last summer.

The process consists of carefully sprinkling or mixing the fine dusty harium peroxide with the tailings or concentrates, etc., previous to running on the cyanide solution, and allowing an extra day or two for the dissolving action to take place. The peroxide is gradually decomposed by contact with the gold and pyrites in the wet tailings, etc., with the result that the free gold is dissolved, the pyrites oxidized to sulphate of iron, and the float gold thus set at liherty from the pyrites likewise dissolved. The gold extraction is, therefore, increased, and it has heen found possible to reduce the residual gold in the tailings from the usual 1.1 dwt. to 0.55 dwt., and in the concentrates from 3 dwts. after the old treatment to 1.4 dwt. The normal oxide of harium, which is left after the treatment, performs further functions—inasmuch as it decomposes the sulphate of iron in the solution, forming a sulphate of harium and oxide of iron, hoth insoluble; it removes sulphocyanides, and it dispenses with the use of lime and answers the purpose of the same, with other minor advantages in addition.

A few details have to he ohserved for the successful decomposition of the peroxide, which is performed entirely in the cold, and the process is as follows: The peroxide powder is well sprinkled with the tailings whilst the vat is being filled, so that a good mixture is ohtained; a rather stronger cyanide solution than usual is run in, and the whole allowed to stand undisturbed for at least three days. The longer the time the better is the extraction, and in the case of concentrates it should he at least a week. After running off the gold solution the residue is washed with four weak cyanide solutions, the first of which should remain six hours. Then, again, a strong solution should be applied, followed hy weak solutions. The quantity of peroxide depends less on the percentage of gold than on the length of time during which the solution remains in contact with the charge; and, further, the more pyrites present the greater the consumption of peroxide. The vat should not he filled to the brim with the tailings as the mass swells up hy the evolution of gas, sometimes as much as a foot. Thus the liberated oxygen should remain undisturhed as long as possihle in contact with the charge, the greatest solvent action of the cyanide heing after a few days. The quantity of peroxide required varies with the material under treatment. For simply the free gold one pound would he sufficient for several hundred tons of ore, hut in actual practice the quantity varies from about one-third to one pound per ton. The cost of barium peroxide delivered in Johanneshurg is put down at £50 per ton.

The actual results obtained at the cyanide works of the City and Suhurhan mine, according to T. J. M. Macfarlane, the manager, show a gain of ahout 13% in extraction, due to the use of harium peroxide at a small cost. The average of twenty charges of fine sands showed an extraction of 89.1% with peroxide and of seventeen charges only 76% without. The twenty charges yielded an aggregate of 4836.6 ounces fine gold, which with the lower rate of extraction would come out at 4125.5 ounces, thus showing a gain of 711.1 ounces, or £3022, at a cost of £130 for the harium peroxide. In the treatment of concentrates an average of three charges using varying quantities of peroxide gave an extraction of 91.3%, whilst one charge without yielded only 78%. The aggregate yield for the three charges was 1216 ounces fine gold, which at 78% extraction instead of 91% would show only 1033.85 ounces, a gain in favor of the peroxide of 182.15 ounces, equal to £774, at a cost of £38 6s. for barium peroxide and £9 for the extra lahor of mixing. The consumption of peroxide with the fine sands, containing about 8 or 10 dwts., was approximately one-half pound to the ton, and with the concentrates, with ahout 28 dwts., it was ahout one and one-quarter pound for the average of the three ex-

Grand Encampment, Wyoming.

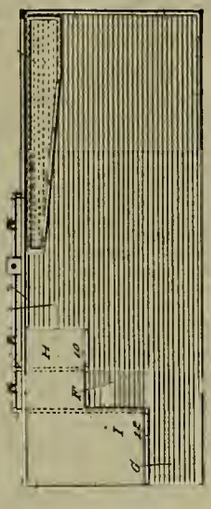
perimental trials. The residues in the former case are worked down to about 1½ dwt., instead of nearly 2 dwts. with the ordinary process of extraction, whilst in the latter case they contain under 2 dwts., instead of 6 dwts. hy the usual method.—Mining Journal, London.

Mining and Metallurgical Patents.

Patents Issued March 25, 1902.

Specially Prepared for the MINING AND SCIENTIFIC PRESS.

CONCENTRATOR.—No. 695,969; B. W. Traylor, Denver, Colo.

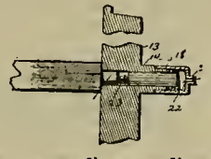


Transversely inclined concentrating tahle mounted to reciprocate and composed of sections extending rearwardly different distances, giving rear edge of tahle stepped appearance in plane of concentrating surface or bed, uppermost section on transversely inclined surface, extending shortest distance toward rear, the other sections in order of location, lowermost section extending farthest distance toward rear, washwater feed located at upper edge of uppermost section, and separate washwater feed for each section, the washwater feed of any lower section extending rearwardly from rear extremity of section next above, along upper edge or step of lower section.

CONCENTRATOR.—No. 696,058; J. A. Lehrritter, Denver, Colo.

Two laterally inclined tahle sections, lower of which adapted to receive tailings discharge from lower edge of upper tahle, slime trough arranged across head of upper tahle, riffles extending longitudinally on upper tahles and terminating at slime trough, return conveyor for carrying tailings from lower edge of upper tahle to head of lower tahle, and compartment separated from return conveyor and adapted to receive slimes from slime trough of upper tahle, compartment heing provided with an outlet allowing slimes to pass lower table in rear of discharge from return conveyor.

MINING CAR.—No. 696,070; J. McAlister, Birwinsdale, Pa.



Wheel having outwardly extending sleeve; journal extending through it and having means to hold it in place thereon, in combination with cap 18 fitting over extended end of sleeve and journal and provided with spirally disposed rih upon internal surface to direct oil normally inward.

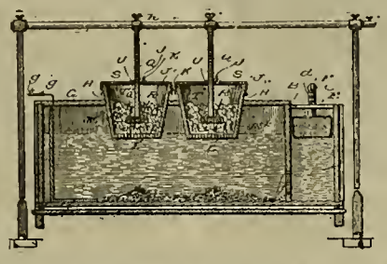
METHOD OF PRODUCING METALS.—No. 696,092; G. H. Clamer, Philadelphia, Pa.

The art of reducing metals from ores by hringing ore into contact with flux and alloy composed of same kind of metal as metal of ore and element more electropositive than that metal, heating all suhstances and effecting combination of electropositive element with suhstance with which metal was combined in ore, fluxing compound of electropositive element, recovering metal set free from alloy and from ore.

PROCESS OF HARDENING COPPER.—No. 696,271; C. Renstrom, Seattle, Wash.

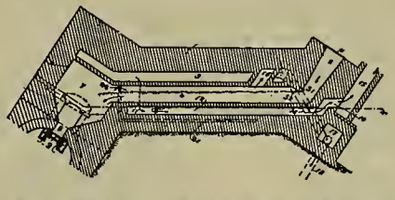
The process of hardening copper or alloys of copper which consists in subjecting same to heat at proper temperature and for proper length of time, and while in heated condition sprinkling sulphur on same, and then suhjecting thus treated copper or alloys of copper, while in heated condition, to blue vitriol bath.

ELECTRIC METAL WORKING APPARATUS.—No. 696,004; G. D. Burton, Boston, Mass.



Receptacle for containing substance to be treated, having perforations in hottom thereof adapted to admit electrolyte, and to permit treated substance to pass out therethrough, a cover for receptacle provided with slot therein, electrode adapted to extend through slot into receptacle, and means for hringing electrolyte into contact with suhstance heing treated.

QUICKSILVER SEPARATING AND CONTINUOUS ORE FURNAOE.—No. 696,323; C. Fitzgerald, San Francisco, Cal.



Inclined muffle and furnace, firebox whereof is directly removed from ore chamher, muffle having parallel floor and roof wherehy surrounding heat is equidistant from all parts of surface of ore, roof having short horizontal projection at its highest end for regulating depth of ore in muffle, ore inlet at upper end of muffle, a chamher in open communication with lower end of muffle, and removed from direct roasting heat, means hy which heated air may he delivered to muffle, vapor outlet for muffle, and means for condensing mercurial vapors.

An Oil Saver.

The injudicious use of ordinary oil cans, as well as some special forms, of which the "squirt-gun" type

is common for a variety of applications, provide opportunities for wastefulness of luhricating oils. The device herewith illustrated in two different forms for economically applying oil to working parts, is reputed to have had its origin in an operating department of pronounced wastefulness, and originally provided for the oiling of mine car wheels, hut its henefits adapted it to various classes of mining and other machinery and general manufacturing institutions wherever luhricants are required. A saving of 50% in lahor and oil is alleged to have followed its adoption in some of the larger coal mining properties. The illustrations of the Ironsides improved Tormay patent oiler herewith are said to he the product of all past experience and from which former weaknesses have heen eliminated and improvements incorporated. It is described hy the manufacturers as an article of superior design, workmanship and great durability. The oiler consists of a central working harrel, containing a plunger and surrounded by an oil reservoir. Openings in the working harrel, sealed or unsealed, according to position of plunger, communicate with the oil reservoir. The adjustahility of the stroke of plunger governs quantity of oil forced each operation. When not in use its contents are not only preserved from leakage, hut also protected from dust and other impurities. The Ironsides Co., Columbus, Ohio, manufacture this oiler.

Utilizing Earth's Interior Heat.

To use the earth's internal heat for industrial power is an old idea presented in a new way hy W. Hallock, who plans to get steam from the interior of the glohe.

He has measured the temperature of some of the earth's deep holes, from which he determines a theoretical rate of increase of 1° for every 60 feet, exceptions to the rule proving that the earth's crust is hotter in some places. He lowered thermometers into the wells near Pittsburg and Wheeling, and found an increase of 1° for every 50 feet. The temperature of the Pittshurg well at the hottom is 129°. Agassiz, of Camhridge, Massachusetts, found the temperature at the 4900-foot level in the Calumet & Hecla mine, at Houghton, Michigan, to he not more than 100°. The heat of the 2500-foot level in the Comstock lode is 145°. The Schladehach well shows a temperature of 135° at the hottom, the Sperenherg well 118°. The Cornwall mines show a temperature of 100°; at Ronchamp, France, the temperature of the coal mines at 3609 feet is 117°. Although it varies in different localities, the heat of the earth's crust grows gradually greater from the surface inward.

Mr. Hallock thinks there would be no difficulty in ohtaining heat from the earth's interior, hecause that involves merely a little extra lahor in horing down into the very hot area, and it is as easy comparatively to hore 10,000 feet as it is to hore 6000; hut to give the steam commercial value, a method must he provided for dropping the water to the hot area, allowing it time to heat, and yet having it returned to the surface as steam without for a moment interrupting the flow.

He argues this way: "Suppose two holes were hored directly into the earth 12,000 feet deep and, say, 50 feet apart. According to the measurements I made in the Pittshurg well, at the hottom there would he a temperature of more than 240° — far ahove the hoiling point of water. Now, if very heavy charges of dynamite or some other powerful explosive were to he lowered to the hottom of each hole and exploded simultaneously, and the process repeated many times, I helieve the two holes might have a sufficient connection estahlished. The rock would he cracked and fissured in all directions as in deep oil wells when they are shot; and if only one avenue were opened hetween the holes it would he enough. The shattering of the rock around the hase of the holes would turn the surrounding area into an immense water heater. The water poured down one hole in the earth would circulate through all the cracks and fissures, the temperature of which would he over 240°, and in its passage it would he heated and turned to steam, which would pass through the second hole to the earth's surface. The prohlem is a mechanical one, and the chief difficulty would he the connecting of the holes at the hottom. This accomplished, the water heater would operate itself and a source of power he estahlished that would surpass anything now in use. Such a system might change the commercial aspect of the world, since the greatest manufacturing communities might gather in those regions which yielded up heat the most readily."

It is the intention of the owners of the Pittshurg deep well to continue the hole down into the earth until some demonstration of the pent-up heat is experienced. This was originally an oil well, hut helow the oil sand a natural gas fissure was struck and each product was used in turn to furnish power for horing.

THE suh-committee of the Senate having the currency question for the Philippines in charge will report in favor of permitting the present silver standard in the Philippines to remain undisturhed, and will report a hill providing for a silver dollar to replace the Mexican dollar, to weigh 416 grains and he 900 fine, the supply to he limited to the needs of the islands and the silver to he purchased hy the Government.

THE Government of China has decided upon mining regulations, under the terms of which concessions may he granted to foreigners in any part of China. These regulations provide that the Government shall receive 25% of the profits; 25% of the output of diamonds and other gems; 15% of the output of gold, silver and mercury; 10% of the output of copper, lead and zinc; 5% of the output of coal and iron, hesides export and likin duties.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

JUNEAU.

The Juneau-Douglas Electric Co. has been incorporated in Seattle, Wash., to construct and operate an electric light and power plant at Juneau. The capital is $1,000,000 and its organizers are A. B. Iles and W. J. Sutherland of Juneau, and W. E. Guerin of Seattle. It is estimated that the plant which the company proposes to construct will cost in the neighborhood of $750,000.

Placer diggings are reported found in Rodman Bay. The pay streak is said to be only a foot below the surface. Rodman Bay is between Killisnoo, a cannery station, and Sitka.

The Treadwell M. Co. are preparing to start up the 300-stamp mill, which has no steam power and is idle during the winter months.

NOME.

Reports from the Arctic district, 300 miles north of Nome, indicate that the district promises to be as good a producer of gold as Nome. A letter dated January 10th says the writer in one day's rocking on Tuttle creek cleaned up $187. On No. 17 on Tuttle creek J. Hanson took out $475 from a hole 18 feet deep without drifting on bedrock. Gold is plentiful on other creeks, but only the Tuttle is being worked at present.

PORCUPINE.

J. Dalton reports the completion of arrangements for the extensive development, during the coming summer, of the Porcupine properties, owned by himself and J. F. Maloney of Juneau. He says Porcupine will be more generally worked this season than before.

VALDEZ.

In the Gladhough mine, near Valdez, the triple-compartment shaft is now down 240 feet. The foundation is ready for the hoisting plant and machinery, which will be sufficient for sinking to the 600-foot level.

The Heidron copper property at Landlock bay, near Valdez, has been bonded to Nelson & Comble, and a development tunnel is being made.

ARIZONA.

E. F. Kelsey, of the Eagle group at Bowie, says that its ledge runs the full length of the tunnel and is rich. Ore is being shipped to the smelters.

COCHISE COUNTY.

It is reported that Manager Brockman of the Commonwealth Co., at Pearce, is arranging for the building of a railroad from Pearce to Cochise, to provide an outlet for the product of the mines. It is also understood that the company proposes to double the capacity of the mill.

T. F. Bostwick and associates have incorporated the Bunker Hill M. Co. to work five claims near Tombstone. There is a 585-foot shaft on the property. Two thousand feet of development work has been done.

GILA COUNTY.

At the Black Warrior works at Black Warrior all of the thirteen leaching tanks are in use, treating 125 tons of ore from the Montgomery mine daily. Tanks are filled and emptied every twenty-four hours, but the time required to complete the leaching process is being gradually reduced, and has been brought down to nineteen hours. Copper precipitates are being accumulated rapidly and smelting is to start. The acid works have made a total output of over 800 tons. Oil is used for fuel exclusively at the leacher and the storage capacity is being enlarged. At the Gold Gulch property a contract has been let to build 1000 feet of road, and the shaft is being enlarged preparatory to installing a hoist.

GRAHAM COUNTY.

The Packer group of five copper claims at Ash Peak has been bonded to an Ohio company for $10,000 for six months. The claims show native copper.

The Detroit C. M. Co. expects to increase the capacity of the concentrating plant in Morenci from 500 tons to 800 tons.

MARICOPA COUNTY.

F. Baxter of Agua Caliente reports a strike in the Eagle Tail mountains, about 25 miles from that place, in a mine owned by M. Cohen and R. Debbs. In a 50-foot shaft the ledge is 6 feet wide of free milling high-grade gold ore. The region is difficult of access. All the water has to be hauled a distance of 25 miles.

Near Wickenburg since New Years the Angel has developed from a prospect into a copper-gold mine of considerable proportions. Crosscuts show the dike 200 feet in width and throughout occur bodies of copper ore. An electric drill will be put in.

MOHAVE COUNTY.

A strike is reported in the third tunnel of the Leland mine, near Boundary Cone, of an ore body 4 feet wide that is claimed to average $100 per ton gold. In tunnel No. 2 there is a larger ore body, but the grade is lower.

The main shaft on the Gold Road mine is 230 feet and will be put down to the 400-foot level. A plant for the reduction of ores will not be installed until the mine has been opened to a depth of 400 feet.

The Minnesota & Arizona M. Co. has increased its capital from $1,000,000 to $5,000,000 to buy a group of mines in the Gold Basin country, near Kingman, upon which they are at work at present. Extensive work is planned and the installation of machinery will soon be made.

Near Chloride the Minnesota-Connor mill is connected with the water supply of the Payroll.

S. C. Bagg, Supt. of the New Comstock M. Co., is putting in ore bins at the mine and driving a tunnel to tap the ore body at greater depth.

A large force of men will be put on the Lucky Boy mine when the new hoist is in running order.

The new gasoline hoist is working well on the Treadwell mine. On the Pioneer, of the same group, a shaft is being sunk.

A company has been formed to take over the old Santa Maria del Bac grant, over on the eastern boundary of Mohave county.

The new management of the Gold Road mines will put on more men and talk of a mill.

YAVAPAI COUNTY.

T. Peters and W. T. Hall have shipped a carload of ore from their Meadow Valley and Rainbow claims, in the Black Hills district, 10 miles northeast from Congress Junction. The ore carries copper, silver and gold.

W. Lester of the concentrating plant on the Agua Fria says some extensive improvements in the plant are soon to be made, which will include an addition of ten stamps to the rolls, Wilfley tables, an extra engine room and an additional engine.

Supt. Kiley of the Oro M. Co., Minnehaba Flat, will have a 60-stamp mill in operation next month.

CALIFORNIA.

AMADOR COUNTY.

W. R. Thomas has bonded the Sargent quartz mine at Middle Bar for four years at $30,000.

A strike has been made of a fine body of ore on the 900-foot level of the Wildman mine, at Sutter Creek.

F. A. Orr has started sinking a 100-foot vertical shaft on his ledge on Indian creek north of Plymouth.

The New Western M. Co. of Plymouth has changed ownership, F. Moffit selling out to W. E. Dargie of Oakland. The latter will start the plant in operation and make some additions to its capacity.

The new 20-stamp mill of the Keystone mine, at Amador City, has been started up and sixty stamps are now dropping. It was at the Keystone that quartz mining in this county was started in the early '50s. After fifty years of continuous working, the mine has now a larger equipment than at any previous period of its history.

The Fremont and Gover consolidated claims, near Amador City, are to be operated on a large scale. Heavy hoisting machinery is to be erected over both shafts, with gallows-frames nearly 100 feet high. A 60-stamp mill is projected and a site has been selected about midway between the two shafts. Rock is now being crushed at the Pocahontas mill, near Dry creek.

The chlorination plant in Sutter Creek, owned by E. C. Voorheis, has been started up, using oil for the sulphuret-roasting fuel at a considerable reduction in cost.

The drifts at the 2400 and 2500 foot levels in the Kennedy East shaft, at Sutter Creek, are being driven ahead rapidly toward the ledge.

CALAVERAS COUNTY.

F. Jantza and H. Bauer are reported to have taken out over $1000 in two weeks from their mine about 5 miles north of Valley Springs. They crushed their ore in a band mortar.

At the San Joaquin mine, near San Andreas, H. F. Stewart Supt., the shaft is down 100 feet. The mill is running five stamps on ore from the upper tunnel. The hoist and mill will be run by water power.

A rich strike has been made in the Mountain View mine, owned by Woodcock Bros., at Glencoe. A shaft is down 120 feet and the 100-foot level shows a vein 5 feet wide of free milling ore.

At the Gwin mine recent development made in the 1750-foot level shows a body of good grade ore of such an extent and character that twenty more stamps are to be added to the mill, which will make 100 stamps. The company will also erect a new hoisting plant, together with a steel gallows frame 100 feet high. F. F. Thomas is the president and general manager of the company and D. McClure, Jr., the superintendent.

It is reported that the Carson Creek mine, near Angels, will be started up on May 1. A new shaft is to be sunk nearer the Stanislaus river.

At the Fanny Marie mine, at Glencoe, another shoot of rich ore has been struck in the 200-foot level. The vein is about 4 feet in width. The 300-foot level is still in ore.

Manager Cortmarsh reports that the shaft at the Bluejay is down 50 feet, and the tunnel is in 55 feet, with ore in the shaft.

Work has been begun on the Greek mine, near West Point, owned by the Greek Mine Co., in which Mrs. H. A. Waldron of Santa Cruz and C. F. Humphrey of San Francisco are interested.

The Duchess mine, near Vallecito, is being developed steadily under Supt. W. E. Emery.

Shepherd & Richmond have bought the water wheel owned by Thomas & Bisbee at Central Hill and will move it to the Tenderfoot mine, near Murphys, to operate the mill.

In crosscutting in the Iowa Con. mine, at Rich gulch, a 6-foot wide blind lead has been struck, showing free gold and sulphurets.

EL DORADO COUNTY.

At the Josephine mine at Volcanoville the tunnel is being retimbered and preparations are being made to install power drills.

Porter & Parker have bought a portion of the Wilton claim at Georgetown and are preparing to work it.

Operations are to be resumed on the Little Gem mine, near Josephine, and on the Sligo, near Spanish Dry Diggings.

It is reported that work will be resumed at the St. Lawrence mine, near Kelsey, by T. Alderson and A. Mierson, the owners.

INYO COUNTY.

At the Reward mine, near Independence, the tunnel on the new vein is now in 300 feet and ore is showing. This tunnel, when connection is made, will be below the present deepest workings in the mine and will be made the main outlet for handling the ore, which is now hoisted to a tunnel at the second level. A new flume, to carry 3000 inches of water, and a power plant of 150 H. P. are being installed. It is proposed to erect a 20-stamp mill near the mine, car the ore through the new tunnel direct to it, and abandon the 5000 feet of wire tram. The present mill building will be utilized as the power house. Air compressors and power drills are to replace the present hand drilling.

In the Panamint valley, about 12 miles south of Modoc, S. R. Phail, L. R. Porter, J. P. Chambers, J. J. Gunn and Eva L. Gunn have sold six claims to E. L. Percy of Los Angeles, who represents Spokane, Wash., people, for $12,000. There is 700 feet of shafts, tunnels and drifts on the claims, and the buyers will do development work, build roads, tramways and put up a stamp mill with concentrators and cyanide plant.

The Mineral Hill Ranch G. M. & M. Co. are working in Panamint valley east of Johannesburg, operating a 5-stamp mill. The property is bonded to a Boston company and two payments have already been made. They contemplate adding five more stamps to the mill besides a smelting and cyanide plant.

KERN COUNTY.

The Mojave C. M. Co. has been incorporated at Bakersfield, capital $200,000, with directors E. W. Craven of Seattle, Wash., C. T. Tryon, C. A. Barlow, J. E. Austin, G. P. McMillan, R. H. Handy, F. P. Roy and A. W. McCray of Bakersfield, J. W. Scott of Omaha, Neb., F. Carmen of San Francisco and S. N. Palmer of Oakland.

The Frazier Mountain M. Co. has developed a ledge of borax ore (colemanite) 12 feet in thickness and of a high grade. The company now has a market for 500 tons a month, which is hauled to Bakersfield and shipped.

The action brought by Kelly & Clemans at Bakersfield affecting the title to certain sections of oil lands are now on hearing and indirectly involve the titles to all of the oil lands taken up under the mineral land law. The point made is that the mineral locations are illegal because they were made before the minerals were discovered on the land instead of afterwards.

MARIPOSA COUNTY.

The Buckeye mine, near Mariposa, has been sold to McRae & Heman by the Krogh Mfg. Co. of San Francisco. The new owners will develop the mine.

MONO COUNTY.

Near Bodie the Blue Vein mine is reported bonded for $100,000.

NEVADA COUNTY.

Supt. Abadie of the Champion M. Co. at Nevada City has started work in the Champion mine to run connecting drifts to the Providence mine. Two will be made—one from the 2100-foot level and another from the 2400-foot level. The Merrifield mine, also the property of the Champion Co., will be connected with the Champion by drifts. The object is to secure better facilities for air in the lower levels.

I. Haas and I. Stein of Grass Valley have bought from C. Mellish his third interest in the Alta California placer mine on Randall Flat, at Rough and Ready. The property covers 140 acres of placer ground, which the owners have proved with shafts and now propose to exploit through a tunnel.

W. L. Bell and A. J. McCone, of Los Angeles, and the manager of the Allison Ranch mine, near Grass Valley, are planning the installation of new machinery, including a large stamp mill and a new hoisting plant.

Fire has destroyed the hoisting works and building at the Eclipse mine at Gold Flat, near Nevada City. During the fire giant powder stored in the building exploded. The loss is total. Supt. B. Hoskins believes that the owners will erect a new plant and resume work soon.

A register issued by the State Mining Bureau shows that this county has 234 quartz mines, 26 placer mines, 5 hydraulic mines, 77 mills and arrastras. Under the heading of miscellaneous mines are included copper claims, barites and calcite, kaolin and granite and marble. Grass Valley and Nevada City are the center of 192 mining enterprises and the 77 mills and arrastras in the county. There are four electrical plants—the Brunswick mill, Gold Hill, Pennsylvania and W. Y. O. D.—all near Grass Valley. Water and steam are used in the majority of the mills operating. Gasoline as a motive power is employed at the Rose Hill mine only. There are several mines at an elevation, approximately, of 1 mile above the sea level.

A 4-stamp mill goes on the Kitts Bros. mine near You Bet.

The National mine, near Granlteville, is putting on more men.

PLACER COUNTY.

The sale is reported to A. C. Burrage of Boston, Mass., of the properties of the Big Channel Con. G. M. Co., on the Forest Hill divide, for a large sum. The property consists of 3500 acres of deep channel placer ground, comprising the Gray Eagle, North Star, Mountain, Spring, Garden, Natches, Wolverine, Owl Creek, Union and Rough & Ready claims. The property is to be opened by tunnels driven from Gas canyon and Owl creek.

The Tadpole Con. M. Co. of Sacramento has elected W. H. Cass president and secretary; J. L. Sparhawk of Iowa Hill has been appointed superintendent. The tunnel at the mine above Westville was advanced in very hard rock 32 feet during February.

PLUMAS COUNTY.

The McGill and Standard mines and one-half interest in the Round Valley Water Co.'s water right have been sold to the Plumas M. Co. of San Francisco. The company will during this summer build a 60-stamp mill and cyanide plant.

Hydraulic mining is to be resumed at the Plumas Imperial mine, near Quincy, early in April.

Work has been resumed by the Quincy M. & W. Co. in its hydraulic mine above Spanish Ranch.

SHASTA COUNTY.

It is stated that the Winthrop group of mines at Copper City, 3 miles from Bully Hill, owned by the Bully Hill M. & S. Co., have been started up. It is said that Capt. J. R De Lamar intends to double the capacity of his Bully Hill smelting plant.

J. C. Frick is in 50 feet on a tunnel on his claim on Middle creek, near Shasta, and has cut a strong vein of galena.

W. A. Pryor has bought a quarter interest of H. A. Whiteman in the Sunlight mine at Shasta, and with T. Greene of Redding he has begun reopening the mine.

The smelting plant of the Mountain C. Co., at Keswick, is now operated wholly by electricity furnished by the Northern California Electric Power Co. The slag railroad, traveling cranes and smelting furnaces—in fact, every piece of machinery about the smelter and works—is operated by power generated at the Shingletown power station, 80 miles distant. It is stated that the cost per H. P. hour with electricity will be about ¼ of a cent.

SISKIYOU COUNTY.

The Portuguese Co. is working a hydraulic claim on upper Greenhorn, near

Yreka. The Portuguese hydraulic claims at Hawkinsville are being worked day and night.

The Leall De Costa hydraulic claim at the lower end of Cherry creek is now being worked day and night with an abundance of water. The claim has paid about $20,000 a season.

T. Quigley has bonded at $20,000 his mining property below the mouth of Beaver creek, near Yreka, to Newkirk & Co. of Detroit, Mich.

At the Minetti B mine, at Nolton, White & Martin, the lessees, are hydraulicking some very rich ground.

Work has been commenced on the Commodore Dewey mine, located in Plowman's Valley district, near Etna, with H. Tissot as manager.

The Pitz Bros.' mine at Oro Fino has been bonded for a company by J. W. Pickard. The mine will be started up immediately.

TRINITY COUNTY.

The Sweepstake Co. has discontinued work on the tunnel to pass the slide on its ditch line, and will temporarily connect the ends of the break by a 1500-foot pipe, which will require but a few days to put in place. A tunnel farther back in the mountain will be run later.

In the Hero drift mine, at Lewiston, an old channel has been discovered at a depth of 26 feet. The blue cement gravel found is 6 feet in depth by 18 feet wide and values of $5 and $6 to the pan of gravel have been found.

F. R. Culbertson, manager for the Trinity County G. M. Co., owning the Chloride-Bailey group at Dedrick, says: "So far the development work aggregates over 5000 feet. The ore is entirely free milling and runs from $12 to $15 to the ton. The ore body is 8 feet in width. It is thought we can mine and mill it for less than $1 a ton. It is our intention to add twenty more stamps to the 10-stamp mill and construct buildings, ore bins, etc."

TUOLUMNE COUNTY.

W. J. Graham, Supt. of the Duleek mine, near Sonora, is arranging to add new machinery to the plant and will run a tunnel 4000 feet in length to tap the ledge at a depth of 800 feet.

Supt. R. Restano of the Golden West mine, near Columbia, says the mill is running day and night now. The ledge, he says, is between 20 and 25 feet wide of ore which goes from $12 to $14 in free gold, and four men can keep the stamps going.

At the Draper mine, near Tuolumne, preparations are being made to sink the shaft from the 500-foot level down another 100 feet.

E. A. Wiltsee of San Francisco has bonded to A. H. Ward of Alameda the Two Brothers and the Little Sister quartz mines, situated near Groveland, also a millsite of five acres at the head of Deer creek, on the Sheehan ranch.

J. E. Doolittle, A. Brown and associates have bonded 1400 acres of land along the Tuolumne river, near La Grange, for gold dredging. They are at present negotiating for 600 acres more, and are projecting the construction of an electric plant at La Grange to furnish power to the mines of Calaveras, Tuolumne and Mariposa counties. The LaGrange ditch and water rights to 2000 inches of water have been bonded by them, and it is expected to commence the construction of the plant the coming summer.

YUBA COUNTY.

On the O'Brien farm Keystone drills are boring holes to bedrock, a distance of 200 feet apart on the 2000 acres. The soil and gravel in places is 40 feet in depth. The earth and gravel taken from these borings are washed to determine the amount of gold to a cubic yard. The calculation is made by determining the number of cubic yards a dredger will handle and properly wash in a day to secure the gold. The three machines will finish the work in May. As soon as the dredgers can be made the work of extracting gold will begin.

A compromise in the case of Relley vs. Campbell results in Weissbein Bros. of Grass Valley assuming the debts and taking over the control of Blue Point gravel mine and ditches at Smartsville.

COLORADO.

Forty of the leading owners and operators of Colorado mines met on the 27th ult. in Denver and held the preliminary caucus looking to a State organization. A. Winslow, manager of the Liberty Bell mine at Telluride, presided. The draft of the constitution stated that the organization is: First, to be known as the Colorado Mine Operators' Association; secondly, that the object of the Association shall be to develop, foster and protect the metal mining industry of the State in all its branches; third, that the membership shall consist of individuals or companies actively operating metalliferous mines in the State, and fourth, that the governing body shall be a council composed of delegates from the different mining camps, such representatives to be appointed or elected by the operators of the respective camps, for such terms as such camps may see fit. The Association's first work is to deal with the smelter trust which is discriminating against certain localities of the State in refusing to take ores, also to secure a reduction of rates now being charged by the smelter; to secure lower freight rates and the abolition of the discrimination being carried on now by the railroads, and to fortify the mine owners against undue aggression on the part of the labor unions. The next step to be taken will be the formation of a permanent body and a second meeting has been arranged for some future date. In the meantime the State is to be thoroughly organized, the plan being to form a Mine Owners' Association in every district of the State. Two organizers have been appointed to act in each district. The representatives of the districts will immediately organize local associations, and where this cannot be done will get the mine owners to select representatives to attend the forthcoming meeting, when the State federation is to be completed. Each district having 100 or more miners in it is to be entitled to one representative up to 500 miners, and one additional representative for each succeeding 500 or fraction thereof. This will make forty representatives who will effect a permanent organization and elect the governing body or board, which will be styled the council. The manner of operation proposed is simple, yet effective. Each district association is left to attend to its own affairs and settle its own troubles, and the State Association will only be called in when the trouble gets beyond the local Association. It has been announced that the Mine Owners' Association would build its own smelters if satisfaction could not be obtained at the hands of the smelter trust.

BOULDER COUNTY.

The Boulder County Co. have completed the erection of their 20-stamp mill near Eldora, and will soon contract for 2000 feet of tunnel work.

The Olympic claim of the Fourth of July group, near Eldora, is now being opened up by a shaft down 65 feet in 3 feet of good shipping ore carrying gold, silver and copper.

CHAFFEE COUNTY.

N. A. Loggin of London, Eng., manager of the Cache Creek placer, near Granite, is starting work on the property. It is expected that a force of 100 men will be employed this summer.

CLEAR CREEK COUNTY.

The Gold Cord M. & S. Co. has bought the Lexington group of mines on Soda creek, near Idaho Springs, and have men cleaning up old workings and extracting ore. There are five patented claims—Golden Link, Preacher, Hamilton, Comet and Lexington.

The Frisco group, four claims on Woods mountain, near Empire, has been bonded to Eastern people, who have commenced operations.

The Golden Hecla M. & M. Co., organized to operate the Silver Horn mine and group on Ute creek, will push the tunnel ahead, which has been driven about 500 feet, and will resume sinking.

Manager Roller of the Reduction Co. expects to be able to handle 150 tons crude ore per day.

At Idaho Springs the Mason Con. M. & M. Co., capital $1,000,000, has been incorporated to work properties in the Lamartine section.

Idaho Springs reports that the Newhouse tunnel closed down on the 31st, the mining companies refusing to make contracts for the working of their properties through the bore. The tunnel had been driven 13,220 feet, and was costing $21.81 per foot to drive it 12x12 feet in size through granite. In the distance driven more than 100 veins were cut. Three companies are working their properties in the tunnel.

At Idaho Springs a recent test was made by the Sun and Moon Co. of 200 tons of their low-grade ore. One hundred tons were shipped to the smelter and 100 tons treated at a concentrating mill. The ore was taken from the same place in the mine and each alternate lode was given to the smelter. The concentrating process is reported to have saved the Sun and Moon Co. $450.

CUSTER COUNTY.

The Bull Domingo property at Westcliffe has been sold and the new owners will equip it for working.

EL PASO COUNTY.

The Rocky Mountain smelter at Florence has been bought by the smelter trust for $1,500,000.

The Telluride Reduction Co. has about completed a plant near Colorado Springs, which comprises crushing, roasting and bromine treatment. It is soon expected to start up.

FREMONT COUNTY.

That the American S. & R. Co. has bought or is negotiating for the Rocky Mountain smelter at Florence is denied by J. B. Grant, who says: "We have all the smelters that we want now and are not preparing to buy any more."

GILPIN COUNTY.

The Helen G. M. & T. Co. has been incorporated by R. A. Gutsch, E. B. Webb and A. Bruderlin, capital $200,000, with offices in Denver. The company will operate a tunnel project in the Pine Creek district, near Central City.

Simonds, Pulham & Co. have sold their interest in a lease on the Continental mine, in Illinois-Central district, near Central City, to B. M. Myers and associates, who have bought the mine from the owner, L. Fake of Chicago, Ill.

Articles of incorporation have been filed to consolidate the sampling works in Clear Creek, Gilpin, Boulder and Summit counties, as ordered by the smelter trust. Some of the plants will be operated by the Chamberlain-Dillingham Ore Co. The capitalization is $1 000,000.

Shipments of smelting and crude ores, concentrates and mill tailings from the Black Hawk depot to the smelters and outside points for treatments during the first three weeks in March totaled 5749 tons.

The Stewart mine, near Wide Awake, is making shipments to the mills from the 140-foot level. An adit has been started from the west side of the mountain to connect with the east 140-foot level, to provide better ventilation. J. A. Gilmour is manager.

The shaft on the Dictator mine, at Eureka, is being put down to 150 feet. Arkansas and Iowa people are interested in a lease and bond, with R. Hastie, Supt. The lessees propose to erect a new shaft building and install a plant of machinery immediately.

At the stockholders' meeting of the Lillian G. M. Co. of Central City, held in Denver last week, W. B. Lewis was elected president and J. C. Lewis secretary.

HINSDALE COUNTY.

Manager O. Pierce of the Tobasco M. Co., near Lake City, is building a tramway, to be between 8000 and 9000 feet in length, to run from the mine to a 100-ton concentrating mill and cyanide plant soon to be built. The mine is owned by Indianapolis people and producing gold ore.

W. Mendenhall has leased the Ocean Wave mill at Lake City and expects to start April 15.

LAKE COUNTY.

A. J. Davis, Jr., who is looking after zinc shipments from Leadville, says of the transportation of this ore from the A. M. W. mill as concentrates, or the mine as crude ore, to Belgium, that the system has been brought to such a perfection that the sampling and weighing are done at the mill with a saving estimated at $1 per ton. Shipments are more than 100 tons daily, including both concentrates and crude ore. Steamers are loaded with 4000 to 5000 tons. Sacking is resorted to in putting the concentrates on the vessels, and by this precaution the only leakage is that on the cars from Leadville to the coast. In discussing the treatment of zinc ores, Mr. Davis was of the opinion that he is certain that the Leadville zinc product will be treated at a profit in this country as it is now in Belgium. Concentration and re-concentration are the gist of the Belgian method. A day's wages of $3 here would represent about what would be paid for seven shifts of twelve hours each in Europe. But balanced against this is the cost of transportation, $10.50, which can be deducted when the ore is treated at Pueblo.

The recent reported find of copper in East Tennessee gulch is stated to be bona fide. The country rock is diorite, locally called Mount Zion porphyry.

OURAY COUNTY.

The Blue Bell M. Co., which owns the Guston, Hudson and National Bell groups of claims near Red Mountain, have the shaft of the Hudson cleared of water and are pushing work with twenty men. The ore is a high-grade silver, copper and lead. Work on the National Bell has also continued during the winter, and a large amount of carbonate of lead ore is ready for shipment. Supt. W. J. Hammond is working two shifts and driving 8 feet of tunnel per shift. The mouth of the tunnel is near Red Mountain. It is now in 3000 feet and is being steadily pushed on to eventually cut the Tom Boy and Smuggler-Union veins at Telluride.

A large 50,000-pound boiler is being installed in the new power house of the Caroline M. Co. at Ouray.

ROUTT COUNTY.

The Coldwater C. M. Co. has made the final payment for their Wolverine property at Pearl. The installation of a plant of heavy machinery is projected, and it is expected that a shaft will be sunk to a great depth on the main lead. Electric drills are to be used and negotiations for water power are being made.

SAN JUAN COUNTY.

The Zuni mine on Anvil mountain, at Silverton, is showing an ore shoot already proven to be over 200 feet long and 40 feet wide. The ore is low grade, but is claimed to be suitable for concentration.

The Hidden Treasure group, with water rights, located near the head of the Animas river, has been sold by R. Hanson of Eureka to a company of Colorado Springs men, who have ample capital to fully develop and operate the property and erect a mill for concentrating the ore. W. B. Wilson of Colorado Springs is concerned in the deal.

It is believed that ten new mills will be erected in San Juan county during the coming season. These include plants for the Silver Ledge, Grand Mogul, Green Mountain Henrietta, Highland Mary, Neigolds, Royal and Hidden Treasure. The Ledge M & M. Co. will erect a $40,000 concentrator of a 200-ton daily capacity at Chattanooga and will connect with the mine. It is stated that work will be commenced in April.

TELLER COUNTY.

Regarding the conditions of the famous Stratton's Independence mine on Battle mountain the following official report was cabled to London by John Hays Hammond: "Recent developments have confirmed the last report. Regret to report the lowest developments unfavorable." From the previous reports referred to it would appear that the life of the mine is limited and depends entirely on the working of low-grade ore.

About one-half the Portland force is laid off. President J. F. Burns favors closing down the mine May 1st and allowing it to remain unproductive until the new Portland mill at Colorado City is ready for operation. He says he is paying heavy treatment charges to the smelter trust. The mill will be ready by June 1st, and it would mean a big saving to the company as soon as it begins to treat Portland ores.

The Cripple Creek March gold production was $2,074,100, treating 53,300 tons of ore.

IDAHO.

BOISE COUNTY.

N. Gratz, Supt. Basic Dredge Co. at Centerville, says the dredger is nearly completed and will be started into operation at once.

J. H. Burton of Salt Lake City, Utah, is said to have bought the Gold Eagle mine at Neal for himself and associates.

BLAINE COUNTY.

The Liberal mine, in the Hailey gold belt, has been taken over by the company and will shortly be equipped for extensive developments. F. R. Reed is manager.

J. Gorman of Hailey has bonded a half interest in the General Gomez, Young America and Gundaker claims, in Little Smoky district, to C. W. Orton of Ortonville, Minn., for $10,000.

CUSTER COUNTY.

A. S. Livingston and Mrs. J. B. Hunter of Denver are working a group of silver-lead mines, near Clayton, about 75 miles from Thunder mountain. Owing to the very heavy snows in winter, the mines are closed about the middle of October each year and reopen in April. The ores are shipped to the smelters.

IDAHO COUNTY.

In Salmon river, east of Grangeville, is reported the renewal of placer operations. In the old channel coarse gold is found under banks of gravel and considerable work is in progress with machinery.

Near Lucille two quartz properties—the McKinley and Black Jack—are being developed.

Six miles east of Grangeville are the Dewey and Evergreen properties. The Evergreen has been a steady shipper to the smelter for twelve months. A. A. Kincaid, manager of the mine, says over 4000 feet of work has been done. The Dewey has a gasoline hoist. A working shaft is being sunk 400 feet. It is said this mine has shipped ore which went $100 to the ton.

Florence, formerly a big placer camp, lies 30 miles south of Grangeville. The Banner mine, the best known quartz property there, is in almost steady operation.

Forty miles southeast of Florence is Warren's camp, at present the end of the State wagon road toward Thunder mountain from Grangeville. The Iola, owned by Chicago men, has a 10-stamp mill, operated by water power.

Daily newspapers are publishing glowing accounts of the riches of Thunder Mountain district. The facts have appeared herein, and readers need no caution regarding the glittering boom stories

now so common. Douhtless good properties will he developed as elsewhere in equally deserving districts, but to entertain any present notion of starting "right away" for Thunder mountain is not good judgment. Two months from now will be time enough to think of starting.

KOOTENAI COUNTY.

At the Richmond mine at Tyson the tunnel is expected to reach the main ledge in April. The owners say a stamp mill will then he installed.

OWYHEE COUNTY.

Samples of ore from a strike in the Sinker tunnel, on War Eagle mountain at Silver City, are very rich, running more than $500 a ton in gold. The ore is found in small hunches as yet.

J. Scales is having the transfer made of the De Lamar M. Co.'s cyanide tailing plant at Wagontown to himself and S. T. N. Smith of Boise. This plant has a capacity of 150 tons per day. Scales & Smith will operate their amalgamating mill also, and employ thirty men this season.

WASHINGTON COUNTY.

The Hero M. Co. has heen incorporated in Philadelphia to operate the Dewey, Hohson and Sampson groups of mines at Heath. The capital is $1,000,000. M. C. Parker is president, A. Donart of Heath vice-president and Supt., and J. H. Bailey, Jr., is secretary and treasurer.

MONTANA.

BEAVERHEAD COUNTY.

Stolle & Taylor, lessees Silver Rule mine, near Argenta, owned by W. A. Clark and B. F. White, shipped two carloads of ore to the East Helena smelter—one carload first-class ore sacked, the second-class loose. The second-class ore will yield ahout sixty ounces silver to the ton and a small per cent in copper and lead.

CHOTEAU COUNTY.

The Big Blackfoot Dev. Co. has been incorporated to work a copper and silver property at the head of the Big Blackfoot river. The property is already developed by a tunnel and shaft on a 7-foot ledge. A. W. Mahon of Valley county, G. H. Stanton of Cascade county, S. McPherson, F. Fryberg, and J. Ulrich of Havre, are the incorporators.

Mrs. Zemich of Marysville, A. J. Craven and Prof. Vollert of Helena have sold to an English syndicate their interest in the property of the Snowshoe P. M. Co. in Keep Cool gulch, near Lincoln, in the Big Blackfoot country between Butte and the Canadian boundary. The consideration is said to have been $20,000. The syndicate has also bought several claims in the immediate vicinity of the Snowshoe ground.

FERGUS COUNTY.

The Paymaster M. Co. at North Moccasin has been merged into the Abhey Cyanide G. M. & M. Co. J. R. Cook is Pres. and Treas., J. Wilmot of Spokane, Wash., Vice-Pres., J. L. Lovell Sec.

Strontium sulphate, the mineral celestite, is reported found in the Little Rocky mountains by E. Massing. The discovery is said to be in a hlanket formation from 30 to 40 feet thick.

The plant of the Kendall G. M. Co. at Kendall is completed and started in full operation. R. K. Neill has had charge of the work of construction for Finch & Campbell of Spokane, Wash. The plant consists of a water power and electric transmission from the Horseshoe Bar ranch, on Warm Spring creek, a 6-mile pipe line carrying water to the mill at Kendall and a cyanide mill of 350 tons capacity with refinery and assay office.

FLATHEAD COUNTY.

The Snowshoe mine, near Lihhy, is developed by 6000 feet of tunnels and a shaft now sinking for the 500-foot level. D. P. Bowers is manager of the property, having taken it over from the Pacific Northwest M. Co. of London. The mill has a capacity for concentrating about 150 tons of ore daily, putting about ten into one. The values are largely in lead, with gold and silver as hy-products, and the concentrates run ahout $55 to the ton. It costs $4 a ton to get the concentrates to the railroad, 18 miles distant.

JEFFERSON COUNTY.

The Mayflower Con. M. Co., operating the Mayflower property, near Whitehall, has heen incorporated in Butte with capital $120,000 hy A. J. Johnston, A. H. Wethey, T. M. Hodgens, C. W. Clark and J. W. Cotter.

The Montana Verde Copper Co. is organized under the laws of South Dakota to work a group of sixteen claims 4 miles from Bernice; capital stock, $2,500,000.

MADISON COUNTY.

Rich high-grade ore has been struck in the Olympia mine at Pony, owned hy Gilhert & Parker. Average samples are claimed to show $150 in gold, 30% lead and seventy ounces silver. The vein is 12 to 18 inches wide.

In the Pan-American mine at Pony, operated under lease and hond hy Macfadden, Drackert & Ervin, a streak of ore 8 to 12 inches wide has been opened, which assay shows to carry $156 in gold, 25% lead and sixteen ounces in silver.

SILVER BOW COUNTY.

Ore from the Alice mine at Walkerville has been shipped to Salt Lake City for testing for a method of treatment.

At Butte twenty-eight hoisting engineers have struck. They have heen receiving $4 a day and demand an increase of $1 a day. They act upon their own initiative in walking out.

Bassett Bros. of Butte, who leased a 10-stamp mill in Homestake district, near Butte, have added a cyanide plant to it. The plant has been started up on ore from the Blue Ridge mine, owned by J. P. Reins of Butte. The ore, it is claimed, will go ahout $15 per ton gold, and the vein is from 3 to 4 feet wide and has been opened 400 feet down. It is claimed that by the douhle process of milling and cyaniding 91% of the gold value of the ore—all of which is gold-bearing—can be saved. If the test proves successful several other prospects in the district will be started up.

NEVADA.

According to the county assessors' returns, the gold and silver production of Nevada for 1901 was as follows: Lincoln county, $1,096,000; Storey, $514,000; Eureka, $250,286; Elko, $168,260; Nye, $262,000; Washoe, $57,000; White Pine, $80,000; Lyon, $67,000; Ormshy, $45,000; Esmeralda, $6280. Tonopah reports were incomplete, but will greatly increase Nye's figures.

CHURCHILL COUNTY.

O. W. Schweitzer states that the Bell Mare group of claims owned hy him and the claims belonging to the Nevada Copper Co. at Cottonwood, near Lovelocks, have been consolidated and the control given to W. W. Gihhs of the latter company. The new company is to hegin the erection of a 100-ton smelter on the Bell Mare property hefore May 1st.

ESMERALDA COUNTY.

The Humphrey Bros. of Crow Spring have two claims on the turquoise deposit. The vein can he traced for 200 feet. Specimens half an inch in thickness and 3 inches square have been taken out. The property has been bonded to Eastern people.

EUREKA COUNTY.

A. Laird and J. H. Hoegh have leased for three years the Alexandria mine on Prospect mountain, near Eureka, from the Alexandria M. Co. of Detroit, Mich. H. C. McTerney of Eureka is Supt.

LINCOLN COUNTY.

The suit of the Utah-Nevada Co. vs. J. R. De Lamar has been transferred from the Superior Court of San Francisco to the U. S. Circuit Court. The complaint recites that I. E. Blake on April 10, 1894, was the owner of a contract to buy the Monitor, Jim Crow and De Lamar claims in Lincoln county, and that De Lamar and he formed a copartnership and hought them, Blake subsequently selling his interest to the Utah-Nevada Co. By the terms of the partnership contract Blake was to receive 49% of the proceeds of the mines. It is alleged that De Lamar has turned over only $7363.44 out of $7,000,000 taken out of the mines. The complainant asks for an accounting and $3,422,636, that amount being 49% of the alleged proceeds.

LYON COUNTY.

R. Logan states that the Hulby-Logan mine at Como has heen started up and work is heing done on the tunnel to make connection with the North Rapidan main shaft. It is estimated a year will be required to complete it.

At Dayton the Davis & Gignoux cyanide plant is to he enlarged to seventy-five tons daily capacity.

NYE COUNTY.

The property of the South Tonopah Con. G. M. Co. of Nevada consists of seven claims, 4 miles south of Tonopah. The company propose to sink the shaft to the 200-foot level and to erect buildings and machinery. A. J. Froehlich is president and E. C. Simpson is seoretary, hoth of Tonopah.

The Tonopah M. Co., in development work in the east drift at the 250 level in the Brougher shaft, have opened up a 7-foot ledge of horn silver ore that, it is claimed, will average $800 per ton in silver, besides carrying its usual per cent of gold.

J. Healey, Supt. of the Tonopah & Salt Lake M. Co.'s mines at Tonopah, reports that in the Stone Cabin claim the vein has heen encountered in the crosscut off the 100-foot level, and that an average of $31 in gold and silver had been obtained from a hreast of ore 6 feet wide.

A specimen of turquoise, found in the Tonopah district of Nevada, has been returned from the East, where it was cut and pollshed. A letter with it states that the specimen is of the finest grade and could be readily disposed of in any quantity. The mine is ahout 12 miles from Crow's springs, near Tonopah. Mr. Humphries, the owner, expects to commence work at once.

The following directors have heen elected in the Tonopah Tunnel & M. Co.: A. L. Hudgens, R. C. Gordon, P. Manning, C. Brougher and T. L. Oddie. The officers elected are: T. L. Oddie president and A. L. Hudgens secretary.

ORMSBY COUNTY.

A strike of copper is reported in the Quill mine 2 miles west of Carson City. The vein is 12 feet wide. It is stated to he concentrating ore and, if so, can be worked without a smelter.

STOREY COUNTY.

The Incorporated Tunnel Extension Co. is organized in New York City to extend the Sutro tunnel and its lateral branches. This is interpreted as intention that the south lateral branch drift of the Sutro tunnel, which now connects with the main shaft of the Alta mine, will be extended to Silver City, a hranch tunnel tapping and draining the American Flat region, and that the main Sutro tunnel will he pushed westward from the Savage mine. It is locally stated that $500,000 has heen provided for the work. The new company is understood to be separate from the Comstock Tunnel Co., which owns and operates the Sutro tunnel.

WASHOE COUNTY.

Another strike is reported in the Wedekind-Reno Star mine, the lead heing reached hy a shallow surface cut. Four feet of ore was exposed, claimed to be practically solid silver sulphide, which assays from $1 to $4 a pound, besides several ounces of gold.

W. H. Elwood of Idaho Springs, Colo., is Supt. for the Willow Creek M. Co., which recently bought the old Galena mine near Washoe. Two shifts are cleaning out and retimbering the old workings preparatory to stoping from a 22-foot vein. A spur track will be put in by the V. & T. and ore will be loaded on the train from ore cars direct from the stopes.

An Ogden, Utah, company has bought the Shannon mine, near Reno. It is an old mine on which considerable development work has heen done.

A strlke has been made of a body of ore in the Harris mine, near Washoe City, which, it is claimed, goes $200 to the ton.

WHITE PINE COUNTY.

(Special Correspondence).—The Morris & Pilot Knoh mine, located near Ely, belongs to J. A. Snedaker and associates of Denver, Colo. The group comprises about 1000 acres. Recently a six-drill air compressor, two pumps, three hoists and two cages have been shipped to the property. Four shafts have been sunk, the deepest being 300 feet. The ore is much leached out and carries gold and copper.

The New York & Nevada group, in the same locality, is having a compressor put in.

The Chainman Co. has a body of lime ore, carrying oxidized iron and gold, at the contact of lime and porphyry. The ore belt is about 200 feet wide, the average value heing about $10 per ton. This company's 800-ton cyanide plant, in charge of Louis Janin Jr., has started up, running about 150 tons per day. It is considered they have a large tonnage in sight.

The McKinley mine has a 200-foot shaft, disclosing a fair grade of copper ore.

On the copper belt of the Ely district the ores from the surface down to 160 feet are leached out and oxidized. Below this general level they become more of a copper and iron pyrite.

Ely is lighted hy electricity generated hy water power on Murray creek.

There is a large timber belt west of Ely, in which there is plenty of yellow and nut pine and mountain mahogany.

There is considerable talk of the Palisade-Eureka Railroad being huilt from Eureka to Ely, a distance of about 80 miles. At present stages run to Ely from Eureka, Pioche and Wells, Nev., and from Frisco, Utah.

Ely, March 18.

NEW MEXICO.

BERNALILLO COUNTY.

The Home M. & M. Co., of Bland, will buy the 10-stamp mill of McKinney in Hell canyon. The custom ore hrought to the mill is to he treated at a cost to the owners of a little over $4 a ton, leaving $1 profit to the mill on each ton of ore treated. The mill will treat ahout 500 tons of ore a month.

The Woodbury mill at Allerton has begun to treat ore from the Iron King mine and also custom ore. It is managed by V. V. Clark.

DONA ANA COUNTY.

A 75-ton concentrating plant has been erected at Organ for the Torpedo and Modoc mines. A 4000-foot tramway has also been completed. On the Torpedo mine the double-compartment shaft is to be sunk 350 feet.

GRANT COUNTY.

The Wilson M. & M. Co. of the Volcano district has completed a 5-mile pipe line for water supply from the Animas valley to the mine, and has a 10-stamp mill started.

The Silver City M. & D. Co. has been incorporated, capital $100,000, with office at Silver City. The directors are E. Harms, E. A. Layne and L. A. Snyder.

A company of Grand Rapids, Mich., and Canadian people has bought a group of twenty-two claims near Stein Pass for $300,000. Two smelting plants are to be built on the group.

LINCOLN COUNTY.

The American G. M. Co. has bought the American mine at Nogal. The mine is equipped with a 10-stamp mill. The company has also bought the Rockford group at Nogal from A. Schinzing.

The Old Ahe mine at White Oaks is reported to be yielding some very rich ore on the 1250 and 1300-foot levels.

LUNA COUNTY.

The General Concentrates Co. has bought the lead property in the Cook's Peak district, formerly owned by J. Onstot. A $30,000 concentrating plant will be erected.

SOCORRO COUNTY.

The Socorro G. M. Co. of Hartford, Conn., are working the Socorro mine in the Wickenburg district. The development consists of a 300-foot shaft and 400 feet of levels, and the company is about to put in a 20-stamp mill, a hoist and a pump of 18,000 gallons capacity. It has 3 miles of pipe line. The tailings are to he worked by the cyanide process.

OREGON.

GRANT COUNTY.

The Golconda mine, in the Cracker creek district, 7 miles west of Sumpter, has been sold for $250,000 by English Bros. of Danville, Ill., to Pendleton people.

JACKSON COUNTY.

In the Roaring Gimlet mine, near Gold Hill, has been developed a new pay lead, from which, with one man panning, $400 a day is being taken out.

At the Mayhelle mine a large two-story boarding and bunk house has been built and grading is being done for a 30-ton capacity mill.

W. P. Chisholm has started the driving of a tunnel to tap the Prosperity lode in the Meadows district, near Jacksonville, to a depth of 250 feet. This vein carries nickel, cohalt, copper and gold.

JOSEPHINE COUNTY.

In the Granite Hill quartz mine in the Louse creek district, near Grants Pass, a vein of high-grade ore lately struck carries values running as high as $500 to the ton. The property is equipped with a 5-stamp mill.

The Oak Flat hydraulic mines, in the Illinois district, have heen bought from Cope, Horn & Cornell by Pool Bros. & Reynolds of Denver, Colo. The mines comprise 1200 acres of hydraulic placer ground lying in the fork of the Illinois river and Briggs creek, with a hydraulic plant and 20-mile ditch from Soldier creek. The new owners will add to the equipment and build a new and large ditch to Briggs creek.

H. W. Ogilbe, C. E., of San Francisco, and B. S. Taylor have heen surveying several weeks in Applegate valley, near Grants Pass, looking for a suitable location for a power plant. Their object is to furnish electrical power for a radius of 30 miles, the power to come from the Applegate river.

UMATILLA COUNTY.

The Big Four M. & M. Co. has been incorporated at Pendleton by J. T. Hinkle, M. Wyrick and J. F. McCarthy, capital $150,000.

UTAH.

Utah mine dividends for the first quarter of the year totaled $1,163,500. For the corresponding period in 1901 the dividends amounted to $585,500.

BEAVER COUNTY.

President L. G. Young of the Hub M. Co. says that work is to he started up at once on the mine near Shauntie in a vein from 1 to 6 feet in width that carries values in gold, copper, silver and lead. It is the intention to sink a shaft on the vein.

S. Newhouse says of the Cactus mine, owned hy him, that the shaft is now down 600 feet and is to go down to the 2000-foot level before mining is started. In the meantime exhaustive experimental tests will be made on the ores, and to that end the machinery for a complete concentrating mill will he installed. Prof. J. M. Callow will build this plant and continue making experiments, hoth as respects the equipment that will be required and the

results attained, till a process and mill perfectly adapted to the ores have been worked out, then a large working plant of any capacity that will require no changes after it is constructed can be installed.

BOX ELDER COUNTY.

F. D. Higginbotham, Sr., Supt. of the West Century mine of Park valley, states that the tunnel, which is now in 350 feet, is advanced from 40 to 50 feet a month, and 200 feet farther will reach the main ledge. The mill is kept running.

EMERY COUNTY.

The Toltec M. Co. has been incorporated at Salt Lake City, capital $30,000, with W. H. Clark president and E. W. Clarke secretary. The company owns the Toltec group of five claims in Stove can yon.

IRON COUNTY.

The Ophir mine at Stateline resumed operations on the 1st inst.

JUAB COUNTY.

The Great Northern G. M. Co. has been incorporated in Salt Lake City; capital, $5000. J. A. Headlund is president and C. C. Anderson secretary. The company owns the Great Northern and other claims in Dowit district.

PIUTE COUNTY.

The I. X. L. M. Co. of Manti has been incorporated, capital $50,000, with J. Snow president and W. C. Snow secretary and treasurer. The company owns the I. X. L. and seven other claims in the Mount Baldy district.

SALT LAKE COUNTY.

The Oquirrh-Bingham C. Co., G. R. Adams Supt, has shipped a fifteen-ton carload of ore from the tunnel on the Amanda vein, at Bingham, the control sample showing 11% copper and $3.42 gold. The total cost of mining and delivering to smelter is estimated as not exceeding $2 50 per ton.

The Laura May G., S. & C. M. Co. has been incorporated in Salt Lake City; capital, $30,000. The officers are R. P. Morris president and W. D. Mathis secretary and treasurer. The company owns the North Star group in the Big Cottonwood district.

SEVIER COUNTY.

Manager C. I. Rader of the Annie Laurie mine, at Gold Mountain, announces that the company has decided to double the capacity of the plant, which will enable it to handle from 500 to 600 tons a day.

SUMMIT COUNTY.

Litigation involving approximately $3,000,000, it is reported, has been avoided by an agreement for the consolidation of the Daly West M. Co. and the Quincy M. Co., both of Park City. The Daly West Co. is to increase its capitalization and take over the Quincy Co. The former company is paying dividends at the rate of $60,000 a month, the latter company at the rate of $125,000 a month. It was estimated that at least $250,000 would be spent in legal expenses, besides the loss involved in closing the mines.

The Elise M. & M. Co. has been incorporated at Salt Lake City, capital $10,000, with J. E. Chisholm president and W. G. Tolhurst secretary. The company owns the Elise and twelve other claims in the Uintah district.

The Anaconda M. Co. has been incorporated in Salt Lake City, capital $15,000, with J. O'Donovan president and A. McKellar secretary. The company owns the Garey group of six claims in the Uintah mining district.

TOOELE COUNTY.

The plans for the new mill for the Sacramento M. Co. at Mercur are approved and Supt. G. W. Cockler will have charge of the work.

A trial of the filter presses lately installed in the Sunshine mill at Mercur, it is stated, has resulted in satisfactory demonstration of efficiency. In the trial the presses took up the silt which has hitherto carried off much of the metal values and the solution which came from the presses was clear and free from slimes. The device was improvised by Mr. Moore, the manager, to perfect the operations of the cyanide plant.

The Mercur M. Co. mill is gradually increasing its output and it is expected that it will soon be averaging 1200 tons per day. It has lately made 1148 tons in twenty-four hours.

The Regent M. & M. Co. has been incorporated at Salt Lake City, Utah, capital $60,000, with T. B. O'Reilly president and F. L. Wilson secretary and treasurer. The company owns the Mistake and Mistake No. 2 lode mining claims in Clifton mining district.

Plans for the new mill of the Sacramento M. Co., at Mercur, have been prepared and active construction is expected to begin at once. Some of the original structure, injured by fire several months since, will be utilized in the reconstruction. The mill will have twenty-six leaching tanks, with a capacity for treating about 150 tons of ore daily, the same as the original mill. G. R. Bothwell is manager.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Horseshoe Co. have bought the chlorinating works at Pluma and the mines of the company in the Bald Mountain district. The new company will put in a 100-ton cyanide plant at the chlorinating works.

The Columbus group of mines, north of the Homestake Co., is bought by H. J. Mayham of Denver. There is ore blocked out and ready to mine as soon as the mill is built.

A property adjoining the Homestake on the southwest is bought by G. M. Mix, formerly general manager of the Hidden Fortune M. Co., and O. P. Th. Grantz, for New York men, who will organize and build a mill.

In the Ragged Top district California men have 150 men on surface work. The Spearfish and Deadwood-Standard have bonded 1000 acres to Denver people, and there is talk of a 100-ton cyanide plant on Spearfish creek.

The Hidden Fortune Co., which has been developing north of the Homestake, is preparing for a 100-ton stamp mill with cyanide annex.

WASHINGTON.

CHELAN COUNTY.

W. J. Bowen has organized the Holden Extension M. Co. to operate the Emma, an extension of the Holden mine, at Chelan.

The company which has bonded the Holden group proposes to build a smelter on the lake shore and operate a short railroad from the mine to the smelter. The contract for the burning of 600,000 bricks and for the making of the railway ties has been let. The Holden ledge is said to be over 100 feet wide, carrying values in copper.

S. H. Dahl of Westby, Wis., a stockholder in the Badger Girl M. Co., operating the Lone Pine group, near Chesaw, says the company will build a mill on the property.

FERRY COUNTY.

At Republic the diamond drill on the Gold Ledge is averaging 15 feet per day. The drill is operated by hand power, an innovation on the usual method of prospecting in that section.

OKANOGAN COUNTY.

The Mineral Hill M. Co., at Conconully, is to have the buildings and machinery lately destroyed by fire replaced. G. Wheeler is manager of the property. It is stated that an electrical plant will be erected.

LINCOLN COUNTY.

A rich strike is reported made by J. Thornbreau near Cedarville. The ledge is said to carry 8 inches of ore which assay 700 ounces of silver to the ton.

FOREIGN.

BRITISH COLUMBIA.

Foreman P. Dwyer of the Hewitt mine at Silverton reports that he has struck 10 inches of 200-ounce ore 120 feet in the long tunnel. Thirty men are employed, all on development work. In the last eighteen months the mine has shipped 2500 tons of ore. It is owned by R. Insinger and F. J. Holman of Spokane and Bennington, Vt., people.

J. Cronin, manager of the St. Eugene mine at Moyie, S. O. Buchanan of Kaslo and W. H. Aldridge, manager of the C. P. R. smelter at Trail, are in Ottawa to ask the Dominion Government for an adjustment of the tariff on lead products in order to encourage the marketing of Canadian lead in Canada. The Government is being asked to put a beavier import duty on manufactured lead products, raising it from about $2 per ton to about $40 a ton, the import duty into the United States. The idea is to manufacture Canadian lead at home, thereby cutting out freight abroad and back. It is estimated that about 40%—about 12,000 tons—of the lead mined in Canada is used there.

At 2150 feet in on the lower tunnel on the Ymir mine at Ymir the main ledge has been struck at a depth of 1000 feet. The values and character of the ore are the same as those of the higher levels.

The Young Australia group of copper-gold mines on Phillips Arm, west coast of Vancouver Island, has been bonded at $35,000, and it is the intention of the bonders to push development work.

The Arlington-Burns group in Deadwood and the Riverside group near Greenwood have been bought at about $50,000 by S. H. Jones and H. S. Ely of Duluth, Minn., for themselves and associates.

The Montana G. M. Co., operating six claims near Deer Park, on Lower Arrow lake, are to have a 50-ton concentrating plant. It is the intention to build a series of settling tanks for the recovery of the silver values in the slimes.

The War Eagle M. Co. of Rossland proposes to erect a milling and concentrating plant to handle the $5 a ton ore in the mine, which has been too low a grade to be shipped.

J. P. Graves, general manager of the Granby Co., says he is getting estimates of the cost of installing a large compressor plant to be operated either by electricity or by steam, when they will increase the output to 2000 tons daily. The new equipment will have sufficient capacity to operate the drills and hoist.

A placer gold discovery is reported on Cooper creek, 20 miles from Kaslo. The creek has been staked for several miles. A company has been formed to build a flume dam. Men are rushing into the camp from all quarters. Gravel taken from the creek bed is said to yield 25 cents in coarse gold to the pan. Gold has been known to exist in that locality for years.

It is reported that the St. Eugene mine at Moyie will recommence shipments about May 1. The mine has for some months suspended shipments on the ground that, at the rates of treatment and transportation, coupled with the low price for lead on the London market, it could not afford to produce ore. With its present plant the St. Eugene can produce from 3100 to 3200 tons of concentrates monthly, carrying approximately 70% lead and forty ounces of silver.

CANADA.

The erection is projected this season of a 200-ton smelter for the treatment of ores and rock from the lake district in Ontario near Sault Ste. Marie. The plant will consist of a converter, reverberatory furnace and a blast furnace. There will be no electrolytic department, the experience of the Lake Superior S. Co. at Dollar Bay, Mich., showing that there is not enough gold to pay for extracting it. J. J. Case, Supt. of the Lake Superior S. Co, is interested. The charter will probably be secured from the Canadian Government.

KOREA.

The Oriental M. Co. at San Francisco want good millwrights to go to Korea to erect an 80-stamp mill. The wages offered are $4 50 per day and board, the company agreeing to pay the fare of men both ways if they remain the full time of the contract.

MEXICO.

G. C. Kaufman, general manager of the mining department of the American S. & R. Co., is reported to have given notice that all the mines of the company in the Sierra Mojada district, Chihuahua, will shut down and remain inactive for at least one year.

At the silver mining camp of Las Planhas, Sonora, there is a 10-stamp mill treating free milling silver ore, to which, it is expected, will be added ten more stamps and a lixiviation plant.

S. Penrose and C. M. MacNeall of Colorado Springs, Colo., have bought for $800,000 the Pinos Altos group of mining claims embracing 31,000 acres in Chihuahua.

W. M. Kiddie of Clifton, Ariz, has bonded from C. C. Rountree of La Colorada, Sonora, Mexico, the Cerro Verde group of mines, near San Javier, and is doing development work on them.

YUKON TERRITORY.

Advices from Dawson state a Gold Commissioner's decision, involving the question of what shall be the base line in creeks where there are many twists and turns, or where the banks are anything but even and in one general direction. The gist of the decision is that a point should be taken and designated the center of the stream, and the center of the creek claim then be made a line drawn perpendicular to the cross line of the creek through the given point. The decision establishes a precedent in this respect, and will enable all to determine how to form the base line of adjoining hill or bench claims, as well as of the creek claims. The decision will affect a large number of claims in the Territory.

Personal.

K. C. PARRISH of Denver, Colo., is in Los Angeles, Cal.

J. H. LIVINGSTON, of San Francisco, is in Placerville, Cal.

THOS. HYE is superintendent North Star mine, Dixie, Idaho.

THOS. I. SLATER is manager Gold Anchor mine, Yankee, Colo.

W. E. GOLDEN, M. E., of San Francisco, is in Tonopah, Nev.

H. W. OGILBE, C. E., of San Francisco, is at Grants Pass, Oregon.

J. B. HARRELL is Supt. Bob Tail 80-stamp mill, Black Hawk, Colo.

JNO. A. LESCHEN has returned from Encampment, Wyoming, to St. Louis, Mo.

V. M. CLEMENT has returned to Salt Lake City, Utah, from Mexico.

DR. CABELL WHITEHEAD, chief assayer of the mint, has resigned.

F. C. DOBLER is now manager Cornucopia mines, Cornucopia, Oregon.

R. S. GRIER is now general manager Woodbury Mining Co, Empire, Colo.

W. H. LINNEY is superintendent De Lamar mill and mine, De Lamar, Nevada.

L. R POUNDSTONE has returned to Gaston Ridge, Cal., from San Francisco.

VICTOR MCCUNE, manager of the Victor mine at Bingham, Utah, is in New York.

CHARLES P. RICHARDSON has returned from Oakland, Cal., to Moose Creek, Idaho.

HENRY COLBATH succeeds H. W. Fox as superintendent Golden Gato mill, Mercur, Utah.

T. R. HEINTZ of Salt Lake, Utah, is visiting his mining property in Shasta county, Cal.

THOS. MOFFETT is the new superintendent Oregon Monarch G. M. Co., Sumpter, Oregon.

G. W. SMALL, M. E., has returned to Salt Lake City, Utah, from a five months' absence in Mexico.

O. O. SAXHANG has been appointed assistant general manager Sonora M. & M. Co., Tuhutania, Mexico.

D. E. SUTHERLAND, of London, is in California examining petroleum deposits and methods of working.

ALBERT BUCKMAN, general manager Con. Alaska M., D. & D Co., Council City, Alaska, is in San Francisco, Cal.

T. H. JENKS goes from Cuba to Senorita, New Mexico, as Supt. at the latter place of the Jura-Trias Copper Co.

R. J. CORY, the Denver representative of the Allis-Chalmers Co., has returned there from a trip through Montana.

THOMAS D. HARRIS, superintendent American Dredging Co., has returned from Leadville to Breckenridge, Colo.

HENRY WOODBURN, general manager War Eagle mine, has returned from Salt Lake City, Utah, to Silver City, Idaho.

J. H. BROWN, Supt. of the Leesburg G. M. & M. Co. at Leeshurg, Idaho, has returned to the mine from San Francisco.

W. HUNTER has returned to Hailey, Idaho, from Arizona, to take charge of some Thunder Mountain mining projects.

L. A. SNYDER, late ore buyer for the Silver City, N. M., smelter, is now with the Val Verde smelter at Val Verde, Ariz.

H. F. STEWART has been appointed Supt. of the San Joaquin mine, near San Andreas, succeeding J. McClay, resigned.

L. A. DUNHAM, manager Clifton Con. Copper Co., Clifton, Ariz., returned to the latter place from Denver, Colo., on the 31st ult.

N. A. LOGGIN, manager of the Cache Creek placer mines near Granite, Colo., has come from London to start up the season's work.

J. F. MEIKLE, former superintendent Red Boy, will have charge of the Golconda, Baker City, Oregon, under the new ownership.

W. C. RALSTON, T. B. BISHOP, W. S. KEYES, F. G. DRUM AND F. H. HARVEY are the present trustees of the California State Mining Bureau.

W. P. SWARTS, late of Chicago, is now connected with the mining machinery firm of Harron, Rickard & McCone, 21-23 Fremont St., San Francisco.

GARDNER WILLIAMS, manager of the De Beers, South Africa, diamond mines, who recently left San Francisco for London, has gone from there to Kimberly, S. A.

E. B. SAWYER is remodeling the chlorination mill at Pluma, South Dakota, for the Horseshoe M. & M. Co., and will start a 100-ton experimental cyanide plant there.

W. A. HUNGERFORD, manager of the Atlas Gold & Arsenic Co. of Hastings, Ontario, Canada, was in Colorado last week, examining a mine development near Ouray.

M. M. O'SHAUGHNESSY of San Francisco leaves San Francisco this month for Honolulu, Hawaii, having been appointed consulting engineer for a large irrigation and water supply company on the island of Kauai.

G. E. BAILEY, under the auspices of the California State Mining Bureau, is about to visit San Bernardino, Los Angeles and Riverside counties, Cal., making special inquiry into the turquoise, tourmaline and lepidolite deposits of those counties, respectively. From San Diego county lepidolite is shipped to Germany, lithia extracted therefrom and thence shipped back to the United States.

Books Received.

"Sewage, and the Bacterial Purification of Sewage," hy Samuel Rideal, D. Sc. of London, England; second edition, 8vo., 316 pages. It follows the first edition just a year later, and is revised and Inclusive of new data obtained in the interval. It is a valuable text book for the use of sanitary and municipal engineers. Published by John Wiley & Sons, 43 East 19th St., New York. Price $3.50.

"The Asphalt and Bituminous Rock Deposits of the United States," hy George H. Eldridge, is an extract from the twenty-second annual report of the U. S. Geological Survey, 1900-01. The subject is very fully discussed and maps, descriptions and illustrations are so complete that those interested should have the book. Published hy the U. S. Geological Survey, Charles D. Walcott director, Washington, D. C.

"The Copper Handhook," 1902 edition, by Horace J. Stevens of Houghton, Mich., 8vo., 416 pages. The hook is an excellent compendium of information relative to copper production. Copper mining and metallurgy are described. The chemistry of copper and the mineralogy of copper receive attention. Descriptions of copper mines ard the statistics of the industry are comprehensive. Published hy the author; price $2.

"Plane Surveying," a text and reference hook for the use of students in engineering and for engineors generally, hy Paul C. Nugent, A. M., C. E., associate professor of civil engineering, Syracuse, N. Y., University; 8vo., 577 pages, 320 figures. This volume will be found just what the author claims for it. The subject is presented intelligently and practically, without an overhurden elther of mathematical theory or practical application. Puhlished hy John Wiley & Sons, 43 East 19th St., New York. Price $3 50.

"A Practical Treatise on Mine Surveying," by Arnold Lupton, M. E. and C. E., of London, England, 8vo, 414 pages, illustrated. The hook is a very complete treatise on the subject as well as heing practical. Dealing entirely with English practice ln mine surveying, very different from the rough-and-ready American practice, it is more for American surveyors a work of reference rather than a text book for the American student of surveying. Mine surveying is particularly a profession in which one becomes practical from commercial practice rather than from the study of text books. Books that are suggestive to the worker thus are more important than text books for the student. Published hy Longmans, Green & Co., 39 Paternoster Row, London, and 91 Fifth avenue, New York. Price, $5.

Catalogues Received.

"Leyner Air Compressors, Catalogue B, 1902," is the title of a neatly illustrated treatise sent out from the office of J. Geo. Leyner, Denver, Colo., illustrating the air compressors manufactured at the Leyner shops, together with sectional detail views that show the mechanism of the different features. The suhject matter goes into an explanation of these machines, with much instructive material on air compression generally. The catalogue also illustrates the Leyner air receiver, rock drills, air reheaters and anti-freezers. The manufacturers will he pleased to mail it on request.

Recently Declared Mining Dividends.

	Payahle.
Bunker Hill & Sullivan M. & C. Co., Idaho,	$21,000..... April 4

Commercial Paragraphs.

AT a log-sawing contest at Marshfield, Or., on the 8th ult., the Simonds saw won first prize.

EXTENSIVE improvements are heing made hy the Greene Consolidated Copper Co., Naco, Ariz., and orders have been placed for 1000 H. P. Stirling water-tube safety hoilers.

THE Mariposa Electrical Power Co., Room 33, 508 California St., San Francisco, want hids for huilding a concrete and masonry dam, statlon, pipe lines and 6¾ miles ditch.

ON April 1, 1902, the Holthoff Machinery Co. began occupation of their new offices at Cudahy, Wis., and all communications should he addressed to them at that place. Their shops are approaching completlon and they expect to have them ready for operation about May 1.

THE Garlock Packing Co. has within the last few months placed on the market a perforated metal insertion sheet packing, patented, designed especially for high pressures and uneven surfaces. The perforations in the metal allow of a complete union of the rubber composition, thus making an extremely firm packing. The company reports a large demand for the goods.

THE month of March has brought to the Crocker-Wheeler Co. orders for eleven more motors to be added to its already large equipment in the new Philadelphia mint. This brings the total number furnished to 120, hesides four generators aggregating 625 K. W. Nearly the entire installation is of Crocker-Wheeler manufacture and the plant is most interesting in the completeness of the distribution of power by electricity. In fact, the metal is electrically treated from the time it enters the building until it leaves it. The electric current refines it, the rough ingot is topped, rolled out and weighed all in motor driven machines, an acid hath then leaves it ready for the coining machines, which are a unique application of a small motor driving a large fly wheel of sufficient momentum to insure a heavy pressure at the instant of stamping. The whole plant demonstrates the extent to which electric operations may he successfully carried.

U. S. CONSUL HOLLIS of Lourenco Marquez writes that he has received from Wilcken & Ackermann of that city (branch house in Johannesburg), a request for American products. The house wishes to secure the agency for steel hars, locomotives and other rolling stock, mining and electrical machinery, pitch pine, Oregon pine, etc., from the United States. Mr. Ackermann, one of the partners, is on his way to the United States to arrange for these agencies. Mr. Hollis helieves that a large trade in these lines can he created in southeast Africa, the Transvaal, Mozamhique and adjoining States. The Consul also remarks that United States firms sometimes make the mistake of giving the agency for Portuguese East Africa to a Natal house. He wishes to remind exporters that Lourenco Marquez is not in South Africa; it is in Southeast Africa, and is the capital and chief port of Mozamhique. There is nothing in common hetween Lourenco Marquez and the British colonies; on the contrary, they are trade rivals. Mr. Hollis advises that local agents be appointed for all articles that it is desired to introduce into Mozambique, and that no reliance he placed upon sub-agents located in ports which are politically and economically widely separated from that province.

Latest Market Reports.

SAN FRANCISCO, April 4, 1902.

METALS.

SILVER.—Per oz., Troy: London, 24⅛d (standard ounce, 925 fine); New York, har silver, 53⅝c, refined (1000 fine); San Francisco, 54c; Mexican dollars, 44½c San Francisco, 43½c New York.

The value of a Mexican dollar has been appraised at $0.437 for the month of April by the Washington authorities.

The new Philippines hill authorizes the Government to establish a mint at Manila and to coin a silver dollar which shall contain 416 grains of standard silver. The silver dollar is made a legal tender in the Philippines. Authority is given for the coinage at San Francisco, at the request of the Philippine Government, of silver dollars authorized by the Act. Silver certificates of not less than $10 in denomination are authorized. Authority is also given for the coinage of a subsidiary and minor Philippine coinage. The U. S. Philippine Commission has fixed the Government rate of exchange for silver, for the second quarter of this year, at $2.27 Mexican silver for one gold dollar. The scarcity of American gold in Manila is attrihuted partly to the banks and largely to Chinese speculators, who always huy American gold at a quotation two points higher than the bank rate.

COPPER.—New York: Lake, 1 to 3 casks, $12.25; carload lots, $12.00; Electrolytic, 1 to 3 casks, $12.00; carload lots, $12.25; Casting, 1 to 3 casks, $12.00; carload lots, $12.25. San Francisco: $14.00. Mill copper plates, $17.00; hars, 18@24c. London: £53 5s per ton.

The new copper rules go into effect at the New York Metal Exchange on the 15th inst. Under these rules all American copper is traded under the new standard contract, which is hased on the contract under which husiness in copper is done in London.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4⅜o 1000 to 4000 lhs.; pipe 5½, sheet 6, har 5½c; pig, $4.75. London, £11 7s 6d per ton.

SPELTER. — New York, $4.35; St. Louis, $4.00; London, £17 10s per ton; San Francisco, ton lots, 5¼c; 100-lh lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lhs., 11c; 100-lh. lots, 13@15c.

TIN. — New York, pig, $26.50; San Francisco, ton lots, 27c; 1000 lbs., 27½c; 500 lbs., 27¼c; 200 lbs., 27½c; less, 28c; bar tin, ℔ lb, 30c.

PLATINUM.—San Francisco, crude, $17 ℔ oz.; New York, $18 per Troy oz

QUICKSILVER. — New York, $51.00 large lots; London, £8 15s; San Francisco, local, $47.50 ℔ flask of 76½ lbs.; Denver, $51.00. Export, $45.00.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 18c; San Francisco, Plumbers', 100-lb. lots, 14.20c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $17.25; gray forge, $17.75; San Francisco, har, 2.75 ℔ lb ,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $31.75; open hearth billets, $32.25; San Francisco, har, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2 65; Hewmoor, $2.50; Trowell, $2.50 per hbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per hhl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19 50; extra sizes higher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19 00; shingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13 00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. h. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17¼c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11 75, long ton.

Receipts of coal at San Francisco in March (exclusive of California and Utah) totaled 120,849 tons, including 67,005 tons from Puget sound and 37,368 tons from British Columhia. For the same month last year the receipts were 149,823 tons. Oil is supplanting coal as fuel.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2¾@3c ℔ lb.; hlue vitriol, 5¾@6¼c ℔ lb.; horax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2¼@ 2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bhls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in hbls. 8c: caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, hoiled, bhl., 76c; cs., 81c; raw, hhl., 74c; cs., 79c; lots of 5 hhls., 1c less; Lucol oil, hoiled, hbl., 66c; cs, 71c; raw, hhl., 64c; cs, 69c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in hulk, 13½c; Mineral Seal, iron hhls , 19c; wooden bbls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, hulk, 15½c; do., cs., 21½c; 86° Gasoline, hulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 20½c; Lard Oil, No. 1 hhl., 60c; cs., 65c; Neatsfoot Oil, hhl., 70c; cs., 72½c; No. 1 hhl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¾c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb , 7¼c; less than 500 lbs., per lb., 7½c; in 25-lb. tin pails, ¼c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¾c; do. in kegs, 7¼c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb , 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c.

ASSAY LITHARGE.—Per lb , 9c.

BISMUTH.—Suhnitrate, per lb., $1.60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c: calcined, 20c.

CHROMIUM.—(90% and over) per lb , $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes—2⅛ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb , $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING MARCH 25, 1902.

696,320.—EASEMENT—C. O. Anderson, Los Angeles, Cal.

696,128.—CLOTHES DRIER—T M. Anderson, New Whatcom, Wash.

695,905.—ANIMAL TRAP—G. Brown, Santism, Or.

696,389.—GANG PLOW—H. Bryan, Modesto, Cal.

696,319 —CIRCUIT CLOSER—D. L. Demorest, Tacoma, Wash.

696,136 —SHACKLE—E. F. Diamond, Oakland, Cal.

696,323 —ORE FURNACE—C Fitzgerald, S. F.

696,031.—CANNING DEVICE — W. H. Fredericks, Portland, Or.

696,172.—CIRCUIT BREAKER—A. J. Higgs, Colton, Cal.

696,141.—ANNING MACHINE—A. Hoob, Alameda, Cal.

696,123.—ADDING MACHINE—A Hoch, Alameda, Cal.

696,239.—BED BOTTOM—J. Hoey. S F.

696,341.—DISPLAY CAHINET—A. L. Johnson, San Luis Obispo, Cal.

696,345.—MASSAGE MACHINE—H. E. Law, S. F.

696,348.—LIFE SAVING DEVICE—W. H. Martin, S. F.

696,251.—EXPLOSIVE ENOINE—J. D. McFarland, Jr., S. F.

696,065.—RHEOSTAT—M L. Miller, Pasadena, Cal.

696,066.—TROWELL—P. S. Miller, Seattle, Wash.

696,078.—DREDGER CUTTER—R. H. Postlethwaite, S. F.

696,271.—HARDENING COPPER—Carrie Renstrom, Seattle, Wash.

696,276 —PAPER ROLL—J. Sinclair, S. F.

696,113.—JAR COVER—H. H. Stevens, Los Angeles, Cal.

696,370.—JOINTER FOR PLOWS—H. Traeger, Auhurn, Wash

695,976.—TELEPHONE—W. D Watkins, San Jose, Cal.

695,985.—LAMP—W. R. Wilson, Baker City, Or.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

CEMENT GRAVEL CRUSHER AND SEPARATOR.—No. 695,076. March 11, 1902. C. H. Ohm, Shellville, Cal. The object of this invention is to provide an apparatus for pulverizing gold-hearing cement which is found adhering to gravel and cobblestones, and to separate it from such stones without crushing the stones themselves. It consists of an inclined trough or mortar hed, and a series of stamps, with mechanism hy which they are alternately raised and dropped in the line of said hed. Means are provided hy which they are prevented from striking the hottom. The lower ends of the stamps are so formed as to facilitate the pulverizing and separation of the cement without striking with such force as to crush the worthless stones. Separating screens are constructed to carry off the gravel and worthless material and a means located below the screens for collecting the valuable cement.

CONFECTIONERY MACHINE.—No. 695,801. March 18, 1902. W. S. Dillon, San Francisco, Cal. This invention is designed for the production of that class of confectionery known as "sugar creams." It consists of an exterior casing, a series of centrally journaled revoluhle hlades, and a series of fixed hlades to operate in unison therewith; one set of hlades having a right spiral and the other having a left. The casing has an opening for the admission of air so that when the revoluhle shaft is turned, and the prepared material is fed into one end of the machine, it is continually worked and air intermixed with it as it passes through the casing, so that it is delivered in the proper cream-like consistency at the discharge end.

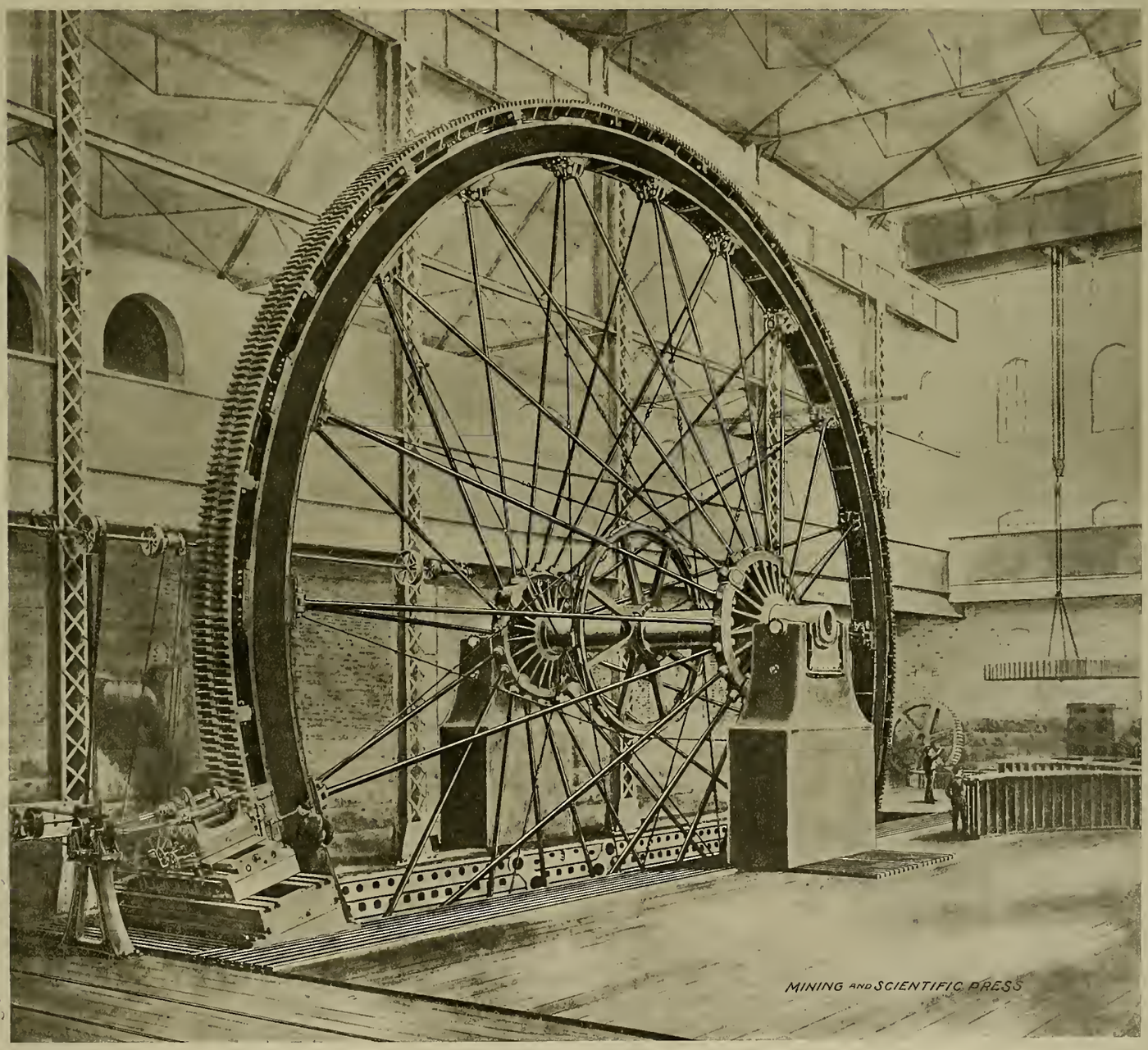
HYDRAULIC PUMP.—No. 695,815. March 18, 1902. C. B. Lakenan, Grass Valley, Cal. This invention refers to pumps used for the removal of water from mines, or the elevation of water, or other liquid from a low level to a higher one The pump is so constructed that water under pressure entering through a supply pipe and conduit will act to force one of the plungers in the operating cylinder into another cylinder which is in line therewith. The single plunger moving in these two cylinders alternately aomits water to the end of one cylinder and the other, and correspondingly discharges it on the return movement. The operating cylinders have likewise plungers within them, are located in line with the pumping cylinders, and the employment of the supplementary hydraulic motor device allows the pump proper to he located at a low level in the well or mine.

MINING AND SCIENTIFIC PRESS.

Whole No. 2177.—VOLUME LXXXIV. Number 15. SAN FRANCISCO, CAL., SATURDAY, APRIL 12, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

A Large Wheel for a Michigan Copper Mine.

The Robert Poole & Son Co., iron founders and machinists at Woodberry, Baltimore, Maryland, is finishing one of the largest wheels of its kind in the world. The wheel is known as a sand wheel, and was ordered hy the Calumet & Hecla Mining Co. for one of their copper mines at Lake Linden, northern Michigan, near Lake Superior. It is being huilt from the plans of the company's engineer, E. D. Leavitt, of Cambridgeport, Mass., and is 65 feet in diameter, weighing, with its hase plates and supporting columns, over 1,000,000 pounds. The shaft, or axle, is made of Krupp's crucible cast steel, 32 inches diameter, 27 feet long, with a 16-inch hole bored through the center, and weighs 42,000 pounds. The journals are 25 inches diameter, 42 inches long. Two gun iron huhs are fitted to either end of the shaft, each weighing 20,000 pounds, and from these hubs radiate forty 4-inch steel arms or spokes, which support the rim sections on the same principle as a hicycle wheel, each spoke arranged with special nuts and threads for fine adjustment when erected in place. The rim is huilt up in twenty segments. It consists of two concentric rings, one on the inside for strengthening the entire structure attached to the radial spokes, and another on the outside, consisting of a toothed gear rim fastened to the inside rim with holts and keys. On the periphery of the outside rim are cast staggered or stepped gear teeth, and these teeth are milled with special tools to an accuracy of one-thousandth of an inch variation. The pitch of the teeth is 4.7 inches. Each row of teeth is 12 inches wide, making an effective working face of 24 inches. There are twenty-six teeth in each segment, or a total of 520 in the entire wheel.



Large Sand Wheel for the Calumet & Hecla Co., Lake Linden, Mich.

To each side of the sectional rim is riveted a rectangular plate iron box, carrying on its inner side 275 buckets—550 buckets in all—each hucket measuring 3½ inches hy 3 feet by 4 inches. The buckets are set at an angle which, together with the periphery velocity, prevents discharge until a horizontal position is reached near the top of the wheel, the distance across the face of the wheel when the huckets are fitted being about 12 feet. The lower part of the wheel dips in a shallow pit, into which the refuse from the stamp mill flows, and as it turns each hucket is filled with water, gravel or sand, and carried up to he discharged at an elevation of ahout 50 feet into a trough, where it is carried away hy the water in sluiceways, the discharge heing close on to 75,000,000 gallons in twenty-four hours. The pinion, or small wheel hy which motion is given to the large wheel, has twenty-three teeth in each row, and is 37 inches in diameter, accurately milled to match the large wheel, and is fitted to a shaft carrying on its outer end a mortise, or wood-tooth wheel, engaging with an iron pinion fitted on the motor shaft.

The electric motor for driving is of 750 H. P., speed 150 revolutions per minute.

The large wheel makes ahout four revolutions per minute, and the periphery speed at the inner edge of the buckets will he ahout 12 feet per second.

It is expected that the wheel will be ready for delivery in about four months, when thirty or forty gondola cars will he required for its transportation from the Maryland works nearly half way across the continent to the mine.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

San Francisco, April 12, 1902.

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The Court's Construction of the California Caminetti Law.

It has been supposed that by the operation of the California Caminetti law hydraulic mining was firmly re-established, free of the harassing injunctions of the courts and the incubus of blackmailing payments which during nearly twenty years previous had cumulated until the industry was paralyzed. The recent decision of Judge Davis in the Superior Court at Marysville, Cal., in the case entitled Sutter Co. vs. the Polar Star Mine et al., is that court's notice to the miners that it does not consider the Caminetti law as having any practical validity at all, and that the old conditions are to be restored. The decision issued an injunction against the mine, compelling it to cease operating, even though it held a license to operate from the debris commissioners, who are charged with the enforcement of the Caminetti law and the regulation of hydraulic mining.

The miners, accepting in good faith the provision of the Caminetti law, have expended vast sums in the construction of dams and the reopening of their mines and have submitted to the restriction and limitation of mining that it imposed. Not all of the mining that was destroyed by the injunctions and direct blackmailing prior to the enactment of the Caminetti law had been re-established, but progress toward that condition was being made. It would have been but a comparatively short time before hydraulic mining would have been yielding upwards of $12,000,000 annually, as in the years before mining by injunction became an institution for rewarding one kind of thrift.

The decision of Judge Davis, if sustained by the Supreme Court on appeal, will not only stop the normal growth of the industry to its old standing, but will make waste of the great sums of money expended by the miners now operating. If the license of the debris commissioners has no standing in the courts, if the latter refuse to recognize hydraulic mining, done in compliance with the provisions of the Caminetti law, as being any different from hydraulic mining carried on without it, the old condition so disastrous to mining and to California will again be in effect. It is not a pleasant prospect that Judge Davis' decision opens up. With hydraulic mining at the license of debris commissioners acting under the law, miners can know what to anticipate. With hydraulic mining at the blackmailing license of informers and spies, the miners can not know what to anticipate.

There is certainly at this time the necessity of prompt, effective action to hold what it took years to gain for the industry. The Miners' Association should fight this decision by appeal clear to the Supreme Court of the United States. It is the old attempt to destroy the mining industry of California revived. It is unfortunate to the State that it should come at the present time, when the general tendency of its industries is toward increase and expansion.

A Fallacy Exposed.

Every little while some one rises in print to make a comparison between the way they mine in Michigan and South Africa and the way it is generally done in California and Colorado. The comparison is always expressed in conclusions uncomplimentary to the latter two. That there can be no valid reason for the difference, and that there is no room for argument is implied in the form the statements are made. Because rarely questioned by authority it is apt to be assumed by the careless reader that the conclusions are unquestionable. This is not so. The conclusions of the kind of comparison referred to are questionable and are not true conclusions from the differences which are compared.

The usual form these comparisons take is a eulogistic description of the large and deep shafts, great hoisting works, and enormous milling plants that are characteristic of the Lake Superior copper mining and the Transvaal gold mining, and of how the operators of these great works plan them on their great constructive scale and invest millions of money in advance of any actual mining or return from it. Then the writer goes on to draw down the other end of the comparison by describing the very much smaller shafts, hoisting works and milling plants of California, and of how no money or comparatively little money is risked in small sums in advance of actual mining and return from it. The conclusion is then stated, as if no other was possible, that the mining capital of California and Colorado is small in amount and ridiculously timid, and that it should imitate to its certain advantage the policy of capital in the Michigan and Transvaal mines. The idea is very frankly advanced that opportunities for mining profits are missed in California and Colorado mines because of the neglect of capital and timidity of its management.

The comparison and conclusion are simply evidence of how the untrained, careless intelligence is influenced and fixed by the surface of what it thinks it sees through. The difference of the surfaces created by the application of capital to plant and dead work construction is the creation of the wide difference in the mines which are beneath the surfaces. The difference in the mines beneath the surfaces is not the creation of the difference in the surfaces made by differences in application of capital, as the careless writers assume. Capital and its methods adjust themselves to the mine, not the reverse.

The beginnings of copper mining in the Lake Michigan country are so many years past that the beginning is largely forgotten now. But if mistakes were made then, or, better, if we did not know of it in the beginning what we know now, we do know now that the lodes or copper-bearing rocks have a remarkable uniformity of metal content, form of occurrence and persistence in extent beneath the surface. The rules of the mines are known, and are almost as certainly exact as are mathematical laws. The exploitation of a Lake Michigan copper mine may be defined as comparable to the solution of a problem involving geometry and simple arithmetic. Experience has made it sure that capital can do its part first in the certainty that the mine will then do its part.

What has just been stated of Lake Superior copper mining can also be said of Transvaal gold mining. The gold-bearing deposit in the mine can be measured and estimated unseen. The mining of it is simply the adaptation of a sum of money—capital—to buy a known quantity of gold. Here, too, as at Lake Superior, the large capital advances in plant are the proper use of it, as determined by the mine that is known.

Gold mining in California and Colorado is quite a different thing. Experience with it has resulted in establishing the fact that ore bodies and the gold they contain cannot be known in advance of exploitation. The great mother lode of California is probably the closest of any to being an exception to the general rule. But the mother lode is not uniformly gold-bearing in quantity or in the form of the rock masses carrying gold, and while the lode is persistent the values in it are regrettably not. All the attempts at making mines on the mother lode have not been successful, and where successful the life period has been indeterminate in advance. As a conclusion from experience with gold mines in California and Colorado, we know that the limits of measurement of commercial metal in advance of exploitation are restricted. Capital adjusts itself to the conclusion of this experience precisely as it does to the conclusion of experience in Michigan and in Transvaal.

There is no true comparison that can be instituted between the two kinds of mining practice. The real comparison is between the kinds of mines. Here California and Colorado have nothing to concede to Michigan or Transvaal. It will probably appear that in proportion to energy expended, of which capital is one form, the two former have somewhat the advantage of the two latter. That is, California and Colorado mining will give more return for less money. And, in conclusion, where the policy of mining capital is being questioned, the question should be as to the correctness of the judgment applied, and not as to the mere element of quantity of capital applied.

Salt Mines and the Salt Trust.

The monopoly of salt production by a trust has increased beyond all reason the price of that necessary commodity. While no longer as universally important in metallurgical operations where roasting is part of the treatment scheme, the aggregate of its use in western metallurgical plants is still so considerable that the raise of the price is a heavy burden on the overworked industry. There is no economic reason why the imposition should continue any very long period of time. Salt mines, in which the mining would be of the simplest description, are quite common in the arid regions of the western United States. They have been little utilized heretofore because the seawater provided the supply so cheaply convenient to transportation facilities that there was not profit enough to justify the cost of establishing a business. The trust raising prices is providing the usual incentive to establish a permanent competition from the salt mines. At present price some team freighting can easily be paid to get the salt to the railroad. In Utah some salt mines are beginning to be worked commercially. Nevada has many deposits, including some alongside of the railroads. In Death valley, Inyo Co., Cal., there is a dry bed of salt on the surface which is 5 miles across at its narrowest width and of undetermined depth. It can be mined crude at the cost of shoveling it into the wagons, and transportation to the railroads would not materially affect the present margin of profit. The desert prospectors, with salt a possible profit-earning mineral, can easily show up many more possible salt mines, some of which could probably be cheaper exploited than those suggested. For metallurgical and chemical use a refined grade of salt is not essential; the crude article as mined is pure enough. There is an opportunity now for the establishment of a large salt mining industry. The existing high prices will carry the extra cost of establishment, which latter, once effected, will be able to successfully maintain itself in competition with low prices. It is notable in this connection that there is no law under which title to salt deposits can pass from the United States and thus make a monopoly of those lands. They are open to the public to take the salt away without tribute to any one. They cannot be located as mines or filed on as agricultural land. Given absolutely even transportation rates by the railroads, these free salt mines that cannot be monopolized will make a salt trust an impossibility.

THE next step in the progress of the International Nickel Company toward becoming a temporary monopoly has been taken. It has authorized a capital stock of $24,000,000, of which $9,000,000 is common and $9,000,000 is 6% non-cumulative preferred issued and $10,000,000 of 5% bonds are issued. It has made a trade arrangement with the Nickel Company of Paris, France, to harmoniously divide profits and prevent the competition of new mines. For a time users of nickel will have to pay more for the metal, but the lime light of publicity which a monopoly always ignites will produce its inevitable result of new discoveries of mines and new discoveries of cheaper processes of reduction and of substitute metals for the uses. For a time the finders of new mines and the inventors of processes will have the monopoly for a good buyer. In the end the monopoly will fail, as other metal mining monopolies have, and consumers will get permanently lower prices and have new uses for an enlarged consumption.

Concentrates.

THE preeeure of the atmoephere at 11,500 feet altitude ie 9 34 pounde, equivalent to about 19 inches of mercury.

WITH the barometer at 30 inches, 1 cubic inch water will make 1.646 oubio inch eteam; at 29 inches, 1.703 cubic inch; at 28½ inches, 1.721 cubic inch.

THE eaving of a cent a ton in the cost of producing iron ore at the Lake Superior mines amounts to about $200,000 annually on the entire production of the district.

THE most economical point of exhaust in a non-condensing engine is that point which will allow the preeeure to fall to the back pressure by the time the piston begins the return stroke.

THE red hairs in the clear quartz crystal are tourmaline. The green haire are also tourmaline. The occurrence of tourmaline in thie form in clear quartz cryetal ie not uncommon in granite rocks.

CALIFORNIA has no hituminous coal suitable for coking. In Washington there are some fields which produce coking coals. For use in hlast furnace they are not wholly eatisfactory, lacking hardness.

GAS METERS and electric current metere are by no means exact measuring machines. The tendency is noted to run slower and register under rather than the reverse. In the majority of the caees the consumer has the beet of the meter.

IN sidehill ditches of large capacity any grade between 5 and 13 feet to the mile can be considered safe and practicable. The nature of the ground the cut is in limits it. The flow should not be made eo rapid as to ecour and wear the eides of the cut.

CONSIDERABLE deep-channel placer mining is heing done in Australia. It is all shaft mining, however, as there has been no such cutting down of etream channele as in California. Proepecting is done by core drilling, drifting hy tunnele being impracticable.

PROBABLY the lowest cost charges for mining and milling at depth on the mother lode in California are now being made in the operation of the Keystone mine at Amador, where the coste are about $1.50 a ton. Water power and electric power are both ueed.

A USE FOR MAGNETITE ORES has been suggested in the making of concrete blocks, and the use of the magnetic and titanic sand in place of common eand. The advantage ie in the additional weight, which, where the blocks are under water, is twice that of the ordinary concrete.

ELECTRIC motore can be conveniently used in connection with large excavation workinge to furnish power to operate power drills, car loading and discharging plants and lighting for working through the night. For excavation work in railroad conetruction it has the advantage of ability to cover considerable linear distances at small costs for installation.

IRON RAILS are preferable to steel rails in mines. The eteel ralle require much more time and labor to bend and straighten, and the use of them involvee more cost in the long run than the iron ralle do, even though the latter may cost more in the beginning. The iron rails will also outilve the steel rails, being lese rapidly corroded by ordinary mine water.

WHILE there ie no mining statute specifically requiring the maintenance of boundary monuments on mining claim locations, decisions of the courts, where the question of the sufficiency of the original marking to enahle the boundarles to be readily traced was at issue, have indicated that the boundary monumente should be maintained to make the location valid.

ECONOMIC geology ie more practically useful to mining engineers than what may be defined as general geology. The former ie more limited in scope of ground covered, but it covere it more inteneively. While a knowledge of general geology is broadening to the mind of the engineer, it is not essential to the underetanding of economic geology, which he must have.

AN ordinary incandescent electric lamp, 16 candle power, will throw off enough heat to ignite paper, cloth or wood in cloee proximity to it. It is a cause of fire that is the more dangerous hecause unsuspected. The flexible cord connection with the lamp, short-circuiting through a defect in the ineulation, can also be ignited hy the arc formed before the safety fuse burns out.

STEEL hae almoet euperseded iron in the manufacture of pipe and tubing. It is now estimated that 75% of the entire product of the country is made of eteel. Up to a few yeare ago wrought iron was used almost exclusively. The lapweld joint proved a serious objection and the change to steel has heen rapid. Steel pipe is stronger, hae longer life, and ie less liahle to corrosion.

CHARCOAL that yields "$35 gold to the pan" ie the latest from Thunder mountain, Idaho. Thie discounte the "white gold" worth $27.80 per ounce" ordinarily reported from the vicinity of Yuma, Ariz., and is coneiderahly ahead of the "tracee of gold in the ashes of a hemlock tree" at Olympia, Wash., and the $4.75 "found in a chicken's crop" at Josephine, Or., the two last annual etatements heing now overdue.

SAWDUST can he ueed for firing hoilers and is regularly in many sawmills. Compreesed into hriquettee hy preseure alone, without any hinder, it has been found an excellent fuel, much superior to wood. Being a costless waste product of lumhering to the extent of 25% to 35% of the commercial lumber product, it would seem to offer some opportunitiee for commercial utilization as a by-product fuel in competition with wood, and even coal.

NORTHERN CALIFORNIA has many mining advantages that justify the attention of the prospector and inveetor, both in hydraulic and quartz gold mining, as well as in copper and other metals. The chief drawback is the inacceesibility of eome parts of that region, but that is being overcome. It has produced a great quantity of gold, platinum and copper, its production being but an index to the possibilitiee of its future output when developed.

LOSSES in gold quartz milling have been very largely reduced by improved practice combining several processes. The ultimate loss as now made ie not fairly statable in terme of percentage when comparisons are being made. The number of cents disappearing in final tailinge should not vary much with different gradee of ore. That ie, good milling practice should lose little if any more cente per ton in tailings with $50 a ton ore than with $5 a ton ore.

THE best results which have been obtained in multiple expansion steam engines are repreeented by the consumption of 11 pounde of eteam per I. H. P. hour. With highly euperheated eteam 10 pounds per I. H. P. hour has been accomplished, and, with a binary type engine, using sulphurous acid in the eecond engine, the steam consumption in a 170 H. P. engine has been brought down to 8½ pounds per I. H. P. hour.

THE treatment of ore at the Bingham, Utah, mine is as followe: The ore is quartz, iron oxide and lead carbonate; the capacity of the plant ie forty tons per day; size of ore leached, mesh ¼ inch; the preliminary treatment ie eodium dioxide; the etrength of the cyanide eolution is 0.025 to 0.125; number of hours leached, 120; one pound of cyanide is consumed to each ton of ore treated; .30 of one pound of zinc is so consumed; the ore assaye one-quarter ounce per ton gold and two ounces silver; the per cent of gold extraction ie 80, at a cost of $1.85 per ton.

THE one kind of talent hardest to obtain, and for which accordingly the highest market price is paid, is that of planning and direction—executive ability. There will be found 500 men ahle to do things under direction to one who is able to plan what to do and set himself or others to doing it. To be ahle to wind one's self up and eet one's self going is a talent in itself, and in the market conception of the case is worth more than any other phaee of individual talent. To be able to not only keep one's eelf advantageouely employed, but to euccessfully direct the lahor of othere, is still more valuable. With this ability temperament and habit have much to do.

A DEPOSIT of natural coke was reported found in Archuleta county, Colorado, about three years ago. It wae of small extent and had evidently been formed by forest firee or other external application of heat to coal measures protected by superimpoeed earth. At Las Prietas, Sonora, Mexico, there is a larger hody of such coke which has been used by the mining company owning the ground for eome time. This depoeit is said to he 10 feet thick and has been taken out 160 feet along the drift. It is eupposed hy some to have been caused by a volcanic vent in the vicinity, others maintain that it is due to surface conflagratione.

THE cost of mucking and tramming the epoil from a tunnel face to the waste dump by hand labor varies largely with differences in conditions, eome of which can be made uniform. The dietance of the tram is the principal variable element, but this ie affected by the kind of rail used, size of cars and grade of track. It pays to make a saving hy providing heavy wide-top T rail track, fi-et-clae steel cars of large capacity, and an absolutely uniform grade to the track, not less than 4 inches or more than 7 inches to the 100 feet. The car ehould run down hy gravity, and be of a weight and design euch that it can be easily puehed hack empty by hand at the ordinary speed of walking.

MEXICAN MINTS receive for coinage whatever quantities may he presented by individuals, whether of gold or silver. The coinage charge on silver is 4.41% and on gold 4.61% of their respective values. In the payment of Government dues or taxes no fixed amount in gold or silver is exacted, and payment is admitted in any of the coins in legal circulation. There are eleven mints in the country. Refined silver is now heing ehipped in considerable quantities from the United States to Mexico, whose silver production is large. Excessive exportations of silver coln from Mexlco to the Orient has caused a stringency in the money market. For a time a scarcity of eilver in Mexico caused a rise in the price of coined silver, hut now the demand is hetter supplied, and the money condition has heen relieved. Mexico has the right of way in eupplying China, Japan, the Philippines and India and all the East with silver coinage.

THE successful placing in midchannel of the San Joaquin river, 2 miles west of Stockton, Cal., of a column of solid concrete 25 feet in diameter and 20 feet high was the work of W. B. Storey Jr. The pier was placed as the main support on which a railroad drawbridge turns to permit vessels to pass up and down the river. Ordinarily such a pier is erected hy sinking a caisson and pumping out the water, so that the workmen really operate dryshod inside the water-tight walls. This maes of concrete was huilt and lowered into place while the water was there. Many piles were first driven deep into the bed of the river and their tops sawed off even with the earth bottom. The projecting piles were used as a sort of scaffolding in the work of lowering the concrete pillar. The big circular mass of cement was formed layer on layer just above the surface of the water and lowered a little at a time, the buoyancy of the water relieving the strain on the supporting piles. Finally the bottom of the mass eettled upon the tope of the submerged eawed-off piles after nearly ten days of lowering and building.

THE determination of the average trend or pitch of a pay shoot—calculated hy explorations or levels driven upon the vein and from end to end of the shoot—the determination of the angle and course of the trend is a matter of importance in devising a system of underground development. On the numerous levels of a mine, well opened, the length of the shoots almost alwaye varies, and even when there is considerable regularity and persistency, the tonnage of the ore fluctuates perceptibly when extracted from the blocks between equidistant levels. To any one making an estimate of the value of a mine or mining property a correct determination of these features is a difficult problem. The pay shoot being short the expense of dead work increases very much, as the cost of sinking shafts, driving levels, making raises and sinkIng winzee, and the coet of crosscuts, through barren ground, may be so considerable in proportion to the amount of stopeable pay ground disclosed, as to render the whole thing unprofitable. When the deposition of the ore has taken place in the form of pockets, the coet of exploration is often In excess of the value of the total amount of pay ore exploited. Of course a small shoot may be tenacious to a coneiderable aepth and carry an unusual high-grade ore, or a pocket, when the mine is of a pocket character, may be of suoh magnitude and value as to give large returne; but these are exceptional cases.

THE combustion of liquid fuel ie complete, that of coal is not; consequently in the former case there is no lost heat in emoke or eoot. There are no ashee or clinkers, and consequently no fires to clean, with the accompanying loss of heat and drop in eteam preseure—the steam pressure and revolutions of the enginee being maintained at one point throughout. The boiler tubes are always free from soot and are clean, alwaye in the best condition for transmitting the heat from the gases paseing through them to the water from the boiler. With liquid fuel the temperature of the escaping gases may be considerably lower than ie required to create the necessary draught for coal firing. With coal the air has to be drawn through the bare, and its fire in the furnaces. By natural draught this requires a temperature of the escaping gasee of from 600° to 700° F. In the case of liquid fuel there are no bars or thick fire for the air to force its way through, and the required amount of air can be drawn through furnaces by a much lower uptake temperature—ahout 400° to 450° F. being in most caees sufficient. The admission of air to the furnace being under complete control, and the fuel heing hurnt in fine particlee in cloee contact with the oxygen of the air, only a small excess of air above that actually neceeary for the complete combuetion of the fuel is required. With coal, in order to ensure as complete combustion as possible, a large excese of air is required.

MANY prospects have been pronounced valueless by mistaken men, which have later developed into rich mines, the judgment of the examiner having been hased mainly on the absence of pay ores, or on inferior valuee of the eame, along the outcrop. The value of the outcrop and the absence of pay values are in no inconeiderahle degree dependent upon the character of the country rocke and the topographical featuree along the etrike of the vein. It would naturally eeem that if the outcrop is exposed for a coneiderable distance—for hundrede of feet in extent—that at some polnt, if the vein contained value at all, there would be pay ore on the outcrop, that one or more of the pay shoots would appear on the surface. It would naturally appear so, coneidering the form of deposition of ore In veine, but, neverthelees, it does not necessarily so follow, and this is owing to attendant features and to meteoric influences. The procese of leaching and degradation of surface ores is not in evidence ae acting upon the ores helow the point of meteoric influences. At the point when the veins were formed the present horizon, or outcrops, were in all prohability a thousand, If not thousands of feet below the surface outcroppings at that time, and the present exieting outcrops heing so far helow the former horizons is attributable to denudation or erosion of the upper euperficial portions. Nature'e changing process goes on through practically incalculable periods of time, and it is apparent that the quality of ores in depth has no important, if any, hearing upon the depth of a vein. A vein may be regarded as a mineralized plane, where the deposition of the ore has taken place in irregular form, to a greater or less extent, and variable in quality—and it has thus taken place both longitudinally and vertically. The source of the ore, as regards character, ie more or less dependent upon the conetituent properties, the nature of the country rocks in which the vein occurs, and through which it passes on its strike and in its depth, as, from these rocks the minerals are in all prohahility moetly derived and depoeited within these veins. And within the mineral and its matrix, especially quartz, being thus formed, coming from combinations of chemical solutions and deposited at euch points in the vein as afford the most favorahle conditions—there are necessarily stretches of barren, nonproductive ground between the areas of pay ore.

Coal on the Pacific Coast.

Of the three Pacific Coast States, Washington ranks first as a coal producer, California second, Oregon third. In the San Francisco market the coals of the world compete. Foreign coal enters that port chiefly as hallast in tramp steamers seeking grain cargoes, so that the condition of the wheat export trade has a direct bearing upon the coal imports. The coal supply of California comes from England, Wales, Scotland, Australia and Japan, in addition to British Columbia, always a principal source for imported coal. The imports of coal at the California ports have for many years amounted to ahout three-fourths of the coal tonnage imported into the United States. Eastern coals reach the Pacific coast only in small quantities, and the Rocky mountain field is not a steady source of supply. The contribution from the three Pacific States to the San Francisco market is growing greatly. In 1861 it was less than 20,000 tons; in 1900 it was ahout 830,000 tons out of a total of over 1,800,000 tons.

The coal fields of Washington are confined to the western and central parts of the State—the northern and the southern Puget sound coal fields, the Roslyn basin, and the southwestern field in Lewis and Cowlitz counties. The northern Puget sound coal field includes the coal mines of Skagit and Whatcom counties, in the northern part of the State. The southern Puget sound coal field lies in King and Pierce counties, in that portion of the Puget sound hasin directly east of the cities of Seattle and Tacoma. In production this is the most important field of the State, and it includes the Wilkeson–Carhonado district in Pierce county, and the Green river, Renton–Cedar river and Newcastle–Issaquah districts of King county. The other field of western Washington lies about 40 miles southwest, in Lewis and Cowlitz counties. The Roslyn field is in Kittitas county, near the center of the State, and on the eastern slope of the Cascade mountains.

The number of coal heds in the Puget sound formation is remarkable, and the workahle heds in a single district may vary from five to ten in numher. At Wilkeson four seams of coal are mined; at Carhonado several seams have heen mined. In the Green river district there are three seams, from 3 to 6 feet thick; in the eastern extension of this field eight workable seams are reported. At Renton three seams are known, two ahout 8 feet thick; at Cedar mountain two seams—3½ and 13 feet thick—have been worked. In the Newcastle district four seams from 4 to 12 feet thick, and at Issaquah six heds from 4 to 15 feet thick, have heen worked. In the northern field the old Bellingham hay seam was 14 feet thick; the present Cokedale seam is 20 feet thick in places, and the Blue canyon seam averages 7 feet in thickness. In the Roslyn hasin there are three workahle heds varying from 4 to 19 feet in thickness. The coals of Washington range from lignite to hituminous coking coal. In the Newcastle–Issaquah and Renton–Cedar river districts the coal is a hard lignite, well suited for domestic use; in the Green river district it is a friable bituminous coal, excellent for steam fuel; in the Wilkeson–Carhonado district it is a very soft hituminous coal, good for coke making, for gas, and for locomotive use. In the Roslyn field the coal is coking bituminous, but in good lumps and well adapted for steam and gas making. The northern field produces bituminous coking coal containing much slack. Both lignite and hituminous coal are reported from the southwest field, whose product is little known.

The mines at Roslyn and Cle-Elum constitute the largest colliery in the State. Various methods of mining are in use, according to the nature of the mines. The miners are hoth white and colored. No machine mining is done in the State. Since 1894 the output of the State has shown a steady increase, and in 1900 King county alone reached the 1,000,000-ton mark. The prospect is for a steady development. The largest market for Washington coal is San Francisco, and the railroads of the Northwest furnish the next largest market. The third important demand is in the local markets of Washington and the adjoining States for fuel for manufactories and gas works. For example, in Spokane fully 80% of the coal supply comes from the Roslyn mines; the remainder comes from Montana and Wyoming, with a few carloads from British Columbia and eight or ten carloads of Pennsylvania anthracite, shipped via the Great Lakes and Duluth. Coal used in Washington is consumed hy smelters at Tacoma, Everett and Northport and in California. The Great Northern, the Northern Pacific and the Columhia & Puget Sound Railroads afford transportation for the coal, and are interested in the present development of the coal industry.

The coal product of California comes from four counties—Alameda, Contra Costa, Amador and Riverside—and there are now four productive fields. The Mount Diablo field, the oldest, is 35 miles east of San Francisco, on the northern slope of Mount Diahlo, of the Coast Range. Somersville is the principal town. Corral Hollow (Tesla), 50 miles southeast of San Francisco, on the southeast slope of Mount Diahlo, lies on hoth sides of the divide petween Livermore valley and San Joaquin valley, and is for the most part in Alameda county. The third, the Ione coal field, is in the foothills of the Sierra Nevada, 90 miles northeast of San Francisco. The fourth field lies in the southern part of the State, in Riverside county, near Elsinore, at the eastern foot of the Sierra de Santa Ana. The Ione field probahly has an extension to the south to Lancha Plana, where coal has been mined. Coal veins have heen prospected elsewhere, and Butte, Del Norte, Orange, Fresno, Monterey, San Diego and other counties have been coal producers. Coal prospects more or less promising are reported from Fresno, Trinity, Mendocino, Siskiyou and Orange counties.

The Mount Diablo field has three workahle heds from 2 to 4 feet thick, the Clark, the Little and the Black Diamond. The Corral Hollow field has two productive seams, the Eureka and the Summit, from 7 to 12 feet thick. The Ione coal comes from a seam from 6 to 24 feet thick, extending under the whole valley hetween Ione and Carhondale. The Elsinore coal seam is from 3 to 10 feet thick. The coals of California are lignites, soft and friahle. The Ione coal shows woody texture, and in the Mount Diahlo mines carbonized wood, pyrite and gypsum are sometimes found with the coal. The Mount Diablo coal fields were early discovered, and had hegun to ship coal in 1861. In 1874, 206,000 tons of coal were mined. The product for the year is reported as 6000 tons, mined hy the Pittsburg Co. The Corral Hollow field was discovered in 1862. After various experiences the present development hegan in 1897, since which time the output has steadily increased. The Ione field, known in 1866, was little worked until 1883, and has since greatly increased the output. Mining operations in the Elsinore field have been on a small scale for local consumption. No coal mining machines are used, and there are no miners' unions in the State. The consumption of California coal is chiefly local. The railroads consume about 20%, steamboats about as much; manufactories take ahout 35%, and the remainder is consumed at the mines and for domestic purposes in the colliery towns. The Southern Pacific, the Santa Fe, the Alameda & San Joaquin and the Pittshurg Co.'s railroad deliver the coal to the consumers or to tidewater transportation at low rates for the larger mines.

Oregon has but one productive coal field, the Coos hay, in Coos county, on the coast, ahout 200 miles south of the mouth of the Columbia, and hetween the Coast Range and the Pacific. It is ahout 30 miles long north and south, with a maximum hreadth of 11 miles, and the total area is ahout 250 square miles. Other fields showing coal of good quality are the Upper Nehalem field, in Columbia county; the Lower Nehalem, in Clatsop county and Tillamook county; the Yaquina field, in Lincoln county, and the Eckley and Shasta fields, in Curry county, all west of the Cascade range. East of the Cascade coal has heen found in the hasin of the John Day river, which includes parts of Grant, Crook, Gilliam and Wasco counties; but little is known of this field. The Coos bay coal field is divisible into the Newton, the Beaver Slough, the Coquille and the South Slough basins. The Newport hasin contains about 3 square miles of coal lands, but the Newport is the only hed that has heen worked. Beaver Slough hasin, over 20 miles long from near Riverton to the northern limit of Coos bay, and ahout 5 miles wide, has seen many mines start and only die. The Beaver Hill mine survives, though no shipments are now made. The prospects for enlargement, however, are good. The South Slough basin lies immediately to the west of the two basins just mentioned. The Coquille basin is ahout 8 miles long and nearly 1 mile wide. Coal has been prospected at the Seven Mile or Big Coal bed in the South Slough basin, and at Harlocker Hill, along the river south of Coquille, but no mines have been opened. The Coos hay coal is lignite and is preferred to other coals for domestic fuel, hut does not generally coke, and is not a good steam coal. In 1880 the Pacific coast field produced about 425,000 tons; in 1890, over 1,435,000 tons; in 1900, over 2,704,000 tons.

Japanese Mineral Products.

Consul-General Bellows, of Yokohama, writes that Japan has furnished a considerable proportion of the world's supply of the precious metals. The following table shows the output of the mines of the country for 1900 (the latest data obtainable), as reported by the mining inspection boards to the Department of Agriculture and Commerce. The values given are computed by the average quotations in the Osaka market:

Description.	Quantities.	Values.
Gold, tons	2.3369	$1,410,390
Silver, tons	6.4686	1,163,606
Antimony, tons	477.6513	60,680
Manganese, tons	17,589.684	81,189
Coal, tons	7,429,457	12,242,353
Kerosene, hhds	571,906	966,872
Copper, tons	28,121.568	8,108,629
Lead, tons	208.72	162,113
Tin, tons	13.67	5,882
Iron, tons	27,602	475,732
Totals	8,075,385.0988	$24,677,446

New Reduction Works, Anaconda, Montana.

Through the courtesy of C. H. Repath, chief engineer of the new reduction works, Anaconda Copper M. Co., Anaconda, Mont., is received a copy of a paper descriptive of that plant, recently presented hy him hefore the Society of Engineers of Montana. Some of the salient points of general interest are given, the admirable article in its entirety heing greatly condensed:

In 1900 Frank Klepetko was made manager of the reduction works, and he, in conjunction with the president of the company, determined to outline plans for a reduction works that would eventually have capacity to daily treat 5000 tons of ore. Preliminary plans were made, the probahle cost estimated, and in April of that year was authorized the huilding of the new reduction works.

The conception of the idea was worked out by Mr. Klepetko, as manager, and the men whom he employed.

The site of the works is on an imposing hillside near East Anaconda, and together with the necessay tracks, storage bins, etc., occupy over 300 acres. Starting from a point near East Anaconda the railroad goes east and south for 4 miles, and then making a loop, still climhing, trails hack upon itself, traveling northward and westward for 3 miles more until it reaches the highest point in the works, which is the top of the concentrator bins. It was necessary to make this long detour in order to reach the height hy easy grades. The maximum grade of the railroad is 1.1 feet in 100 feet, or something like 55 feet per mile. The top of the ore bins at the concentrator is something like 350 feet ahove the level of the valley. From a point ahout 3 miles up Mill Creek valley there is another railway spur of 1½ miles going into the works at a lower level. There is also another spur from the Mill Creek line going into the converter plant, which will take out the finished product of the works. This line is ahout ¾ of a mile long, from where it hranches off from the main line, going up the Mill Creek valley. Work hegan June 18, 1900, and from that time till finished several hundred men were constantly employed.

In giving a description of the works it is hest to take for a starting point the building in which the ore is first received—the concentrator huilding. The ore, as it is brought in from the mines, is delivered in steel cars on top of steel ore bins that are ahout 70 feet high, and the ore is dumped automatically into these hins. These bins are practically two stories in height; the upper part of the bins are used as receiving bins for the ore as it comes from the mines, and the lower part of the hins are used for storing coarse concentrates and the ore that has passed through the sampling mill, which is situated just hack of the concentrator. Custom ore, and other ores necessary to he sampled, are also dumped into the upper bins. These hins are partitioned off into sections, part of them heing used for concentrating hins and the others for sampled ores. Custom ore and other ores that are necessary to sample are taken from the hottom of these upper hins and conveyed to the sampling mill hy an electric tram car. The ore that is suitable for smelting is taken from the sampling mill after it has heen sampled and delivered to the lower bins in this structure. All of the work is made as automatic as possible.

The sampling mill is 42 feet wide and 60 feet long and is five stories in height. It is equipped with crushing machinery and sampling machines sufficient to treat 1000 tons of ore per day of twenty-four hours.

The concentrator building proper is in two parts of four sections to each part. Each part is 250 feet wide by 350 feet deep. Its estimated total capacity is 5000 tons in twenty-four hours. It is divided into several departments. The crushing department is about five stories in height and equipped with heavy machinery for doing the first crushing of the ore. Eight large crushers receive a piece of ore that is 10 inches wide, 20 inches long and 12 or more inches in height, and crush it into cubes not larger than 2 inches in size. From these the ore passes to sixteen smaller crushers, which crushes it still finer, and then again large rolls take the ore and crush it finer still. Between each of these operations a separation takes place and the ore is separated from the gangue by automatic machinery. Next is the jig department, equipped with 432 jigs, which take the ore, separate it from the gangue automatically, and then the ore is automatically conveyed to storage bins, the gangue taken to another crushing department, where it is crushed still finer, and again put through a separating process in jigs.

Next is the regrinding department, where the ore is reground in Huntington mills of special design, and the ore is ground as fine as the finest sand. This department is fitted with sixteen 5-foot mills and twelve 6-foot mills. Another separation takes place in this department, the ore being automatically conveyed to storage hins. There are 144 jigs in this department.

The next two are table departments, which treat all the fine material which the mills make. These are fitted with 230 Wilfley and twenty-eight Overstrom concentrating tables. The concentrates from the

whole mill are conveyed into large wooden storage hins at the lower end of the concentrator. These hins are 650 feet long and 70 feet wide, and will hold several thousand tons of concentrates.

Power for the concentrator and other purposes is supplied from a power house locatcd hetween the two halves of the concentrator. The concentrator boiler house is 28 feet wide, 190 feet long, and contains ten Stirling hoilers in five hatteries, aggregating over 3000 boiler H. P.

The power house, in which is the machinery for furnishing power to the works, is between the two halves of the concentrator, and is 136 feet wide, 148 feet long. It contains two four-cylinder triple-expansion engines, capahle of developing at a maximum load 3600 H. P. each. In this power house is also located one four-cylinder triple-expansion Fraser & Chalmers Corliss engine, that was originally used to furnish power at the World's Fair. This engine will develop, at maximum, 1150 H. P.

Power is transmitted from the engine through a main line shaft hy means of thirty-six 2-inch manila ropes. Power is transmitted from the Fraser-Chalmers engine hy means of a $\frac{5}{8}$-inch leather helt 5 feet 6 inches wide, 175 feet long.

This power house is also equipped with 2700 kilowatt Westinghouse two-phase alternatlng generators, and one 500 kilowatt general electric direct current generator, hesides smaller arc light and power electric machinery.

All of the electric power for furnishing light to the city of Anaconda, and power for operating the street railway, will be furnished from this power house, and ample provision has been made for any increase of service that will be required in the future. The electric power that is to be used in the new reduction works will also be generated at this power house.

The total horse power of all the machinery in this building will aggregate 10,000 H. P.

There was used in the construction of the power house building, ore hins, concentrator huilding proper, and in the steel railroad approaches to the building, over 6000 tons of steel and over 10,000,000 feet of lumber. The huilding itself occupies a space of nearly seven acres, and is one of the largest plants of this kind in the world. It is fully equipped with modern machinery for the treatment of Butte ores. The total cost of the power plants and the concentrator huilding will approximate $2,000,000.

The ore, after heing treated in the concentrator, is stored in storage hins as previously mentioned, and is then conveyed in cars hauled hy compressed air locomotives to the upper floor of the roaster building. The concentrator and roaster buildings are connected hy tracks ahout 1300 feet long. To reach the upper floor of the roaster huilding it was necessary to construct a trestle work that at one end was over 50 feet high. This building is 98 feet wide and 330 feet long, and is equipped with forty-eight roasters capable of handling from thirty-five to fifty tons of concentrates each twenty-four hours. The ore is delivered in hoppers that feed into the roasters automatically, and comes out at the hottom of the roasters ready to be taken to the reverberatory building. All of the operations are entirely automatic. This huilding is provided with a dust chamher 40 feet wide, 300 feet long. The power is furnished by alternating Westinghouse induction motors. This huilding is also provided with a smokestack 23 feet 6 inches outside diameter, 200 feet high, exclusive of the foundations. Nearly 1500 tons of steel and iron entered into the construction of this building, dust chamher and stack, besides large quantities of hrick and stone. Over 2000 tons of steel and iron entered into the construction of the furnaces.

The roaster and reverberatory buildings are connected by a series of tracks, the calcines are conveyed from the storage hoppers underneath the roasters to the hoppers above the reverberatory furnaces by means of compressed air locomotives and cars.

The reverberatory plant consists of two buildings; one 182 feet wide, 174 feet long; the other, 182 feet wide, 225 feet long. These buildings contain fourteen reverheratory furnaces. In the center, between the two huildings, is a large stack of the same size as that of the roaster building. Four large flues from these two buildings enter the base of this stack. This building is absolutely fire proof. Over 2500 tons of steel and iron were used in constructing this building and the furnaces. The building is so arranged that the silica from the furnaces is granulated by means of water and carried in launders over the B. A. & P. railway tracks, and deposited on the flat in front of the works. In order to carry the granulated silica it has been necessary to construct several trestles. They are constructed of cedar poles averaging from 60 to 80 feet in height. These launders are lined with cast iron liners for the full length, and are over 1000 feet long.

The blast furnace huilding is the next one to be described, taking the method of treating the ore as a guide. Storage bins for receiving ore to be treated at the blast furnaces have been provided. Part of them only have been completed, but the structure is so designed that it can be filled at any time and the framework made into storage bins. These bins occupy a space over 850 feet long and 110 feet wide. They will have a large storage capacity for materials that are to be smelted in the blast furnaces, consisting of first-class ore, lime rock for fluxing, converter slag, coarse concentrates, coke, etc., and all materials that are smelted in blast furnaces. Part of these bins are used for the storage of coal for the reverheratory furnaces and coal for the hoilers located in the smelter power house. Over 7,000,000 feet of lumher have entered into the construction of these hins. The materials are delivered into these hins from the railroad cars on top of the hins, and the cars dump automatically into the hins.

The blast furnace huilding is 82 feet wide, 195 feet long. It is equipped with five large hlast furnaces, capable of treating over 1500 tons of material per day of twenty-four hours. This huilding is equipped with a dust chamher 40 feet wide and 182 feet long, and a smokestack of the same size as the reverberatory and the roaster stacks. There has entered into the construction of this huilding, smokestack and dust chamher over 500 tons of steel and iron, and into the construction of the furnaces themselves over 300 tons more of steel and iron, hesides large quantities of hrick and stone.

In connection with the hlast furnace plant and storage hins there has heen a hriquetting plant designed that is 64 feet wide and 175 feet long, with an annex for covering drying machines, 47x150 feet, for pressing fine material into hricks 3½ inches diameter, 2½ inches thick. This material will he smelted in the blast furnaces, and is put into this shape to prevent losses hy means of fine stuff heing carried up and out into the atmosphere hy the strong draft in the stacks and the hlast in the furnaces.

The next plant to he described is the converter plant, a huilding 177 feet wide, 416 feet long; part of this building is used for a converter repairing plant. This building is equipped with eight stalls for converters and twenty-four converter howls, there heing three converters to each stall. These converters are the largest that have ever been huilt; they are 8 feet in diameter and 12 feet 6 inches long. The estimated capacity of the plant is 500 tons of matte per day of twenty-four hours. This huilding also contains two reverheratory furnaces that receive the molten matter from the reverberatory and blast furnace plant. The matte is conveyed hy means of large ladle cars holding twenty tons of matte in each car, the motor power heing compressed air locomotives. The matte can also he charged directly into the converters without passing through the receiving matte furnaces. This building has also three copper casting reverheratory furnaces fully equipped with machinery for casting anodes and bars of copper. Slag from the converters is made into small hricks by means of slag casting machines; the slag is poured into molds which are carried forward hy means of chain helting outside the huilding into receiving hins for the slag.

In this huilding there are also two electric traveling cranes, having a span of 60 feet each. They are capable of lifting ninety tons each; also there is an auxiliary crane to he used for repairing these large cranes just overhead. This crane will lift a load of forty tons.

In connection with this building there is a large dust chamber, 264 feet long and 40 feet wide, and a stack, having the same dimensions as the stacks at the other buildings in the plant.

There has entered into the construction of the converter building, dust chamher and stack nearly 2000 tons of steel, besides large quantities of brick and stone. In connection with the converter plant there is a converter repairing plant, fitted with the necessary crushing machinery for grinding clay and slag for lining the converters. The power in this building is all electric power.

For furnishing power to the last two named buildings there is a power house known as the smelter power house, that is 84 feet wide and 525 feet long. In this building there is located twelve Stirling hoilers, aggregating 3150 H. P.; also four large direct connected Corliss engines and blowers capable of furnishing 120,000 cubic feet air per minute for the blast furnaces; also another large triple-expansion hlowing engine for furnishing air for the converters. This engine will have a capacity of 20,000 cubic feet air per minute. In this building there will also be located two large blowing engines that are to be taken from the old works; changes will be made on these engines that will make them more economical. They will furnish additional supply of air for the converters; also two air compressors for furnishing air at 1000 pounds pressure for operating air locomotives, and one for furnishing air at 100 pounds for ordinary purposes.

The water supply for the works is brought in a flume over 7 miles in length, capable of carrying, under ordinary seasons, the whole flow of Warm Springs creek, for several months in the year, except in flood time. This flume will carry over 50,000 gallons of water per minute, and is built so that its capacity can be increased at least 25%. The flume terminates in a large screening tank, provided with screens to catch any floating material that may be in the water. From this screening tank it is taken to large redwood tanks, which have about 100,000 gallons capacity. From these tanks pipes 40 inches diameter convey the water to the concentrator, and from another large tank the water is conveyed to the power house and other plants hy means of 24-inch and 30-inch redwood water pipe lines.

The whole works is provided with a system of standard gauge railway tracks for the purpose of carrying on the work between the different plants. These are all inter-connected, and one can travel from the upper side of the concentrator clear to the converter plant on railway lines. The motive power used is compressed air, compressed to 850 pounds per square inch. Air at this pressure is conveyed in pipes all over the works, and charging stations are provided at intervals for charging these air locomotives. Each locomotive has two large tanks which contain air at 850 pounds pressure, and sufficient air will be stored in these tanks to enable the locomotive to travel a distance of half a mile under full load. Each of these locomotives weighs twelve and one-half tons, and as the tracks are level where most of the work is to he done they will he capahle of hauling over seventy tons of material at a trip if necessary.

The construction of the works necessitated the using of 50,000 yards of masonry and the removal of over 250,000 yards of excavatiou. There has been used over 1000 cars of red brick and fire brick. There has heen used in the works over 20,000,000 feet of lumber, exclusive of about 5,000,000 feet more, used in the construction of the flume.

There has heen nearly 40,000,000 pounds of structural steel and cast iron in the shape of material, etc., used in the construction of the works. There has been delivered to the works over 10,000 cars of all kinds of material that entered into the construction of the plant.

Frank Klepetko has heen the manager of the works, and the plant as it stands to-day is the fruition of his idea as to what a reduction works should be. For assistance in the work he has had C. H. Repath as chief engineer, as the one directly responsihle to him for carrying out all the details in connection with the work.

Assaying of Low-Grade Silver Ore.

To the Editor:—If your correspondent who has trouhle with assaying a low-grade silver ore containing "a great deal of sulphur" will try scorification, I think he will have no further trouhle and can do his work with more rapidity and less likelihood of error than hy preliminary roasting. If he takes 0.1 assay ton for a charge he can weigh his head down to 0.1 ounce per ton if his balance is sensitive to 0.01 milligram, which is close enough for commercial work. If the ore contains little or no arsenic or antimony, he can make a crucihle fusion of one-half assay ton without roasting hy using a flux of soda, borax, potassium carhonate and just enough litharge to furnish a lead hutton of proper size for cupellation, adding four or five ten-penny nails. If there is little or no lead in the ore, 18 grams of litharge is ahout right. In this fusion the sulphur, as it is released from its comhinations in the ore, first attacks the litharge, abstracting its oxygen and reducing it all to lead. Then the excess of sulphur attacks the iron and the iron sulphide goes into the slag. A fusion of this kind takes from thirty to forty minutes at a good heat, seldom hoils up, and yields a soft lead button, about 15 grams, with no matte. If the ore is galena a simpler and very satisfactory method is to use soda, borax and litharge for a flux, with a few grams of niter to take care of the excess of sulphur. I know of no objection to the use of niter. I should use it very often, but for the fact that it is hard to determine the amount necessary to use, without a preliminary assay, and that is out of the question in a busy office, while the nail fusion always brings a button of proper size.

If your correspondent will mail me a sample of his ore I will be glad to give him a formula that will handle it satisfactorily. C. M. Fassett.

Spokane, Wash., March 27.

The World's Production of Spelter.

H. R. Merton & Co., London, have compiled figures on the world's output of spelter in 1901. In the following table are compared the 1901 figures, as per Messrs. Merton, with the production for 1900, figures in long tons, 2240 pounds:

	1900.	1901.
Rhine, Belgium and Holland	186,320	199,285
Silesia	100,705	106,385
Great Britain	29,830	29,190
France and Spain	30,620	27,265
Austria and Italy	6,975	7.700
Poland	5,875	5,935
Totals Europe	360,325	395,760
United States	110,028	122,830
Totals	470,353	498,590

Thus the total production of spelter or metallic zinc increased 6%. The gain in Europe was 4.3%, while in the United States it was 11 6%. The United States produced 24 6% of the world's total in 1901, as against 23.4% in 1900.

Dr. Le Neve Foster reports that the quantity of minerals produced throughout the world in 1900 was: Coal, 767.636.204 tons; iron, 40,427.435 tons; petroleum, 18,553,950 tons; salt, 12.572,076 tons; fine silver, 5,874,284 kilos; lead, 787,841 tons; copper, 534,735 tons; zinc, 446,373 tons; fine gold, 393,196 kilos; tin, 80,643 tons.

Placer Mining Kinks.

NUMBER III.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by CHAS. P. RICHARDSON.

DELIVERY OF GROUND SLUICE HEAD IN PIT.—If your giant and pipe line are small it is often necessary to bave a "ground sluice" flow of water delivered in tbe pit in addition to tbe water supplied by the giant stream. Witb banks of 30 feet depth or more of soft gravel tbat cuts very easily under a flow of water, it is sometimes quite a problem to get the additional water into the pit witbout having one's sluices continually loaded witb material brougbt down by tbe ground sluice flow, and likewise a problem to deliver tbe flow at tbe point wbere it is most desired. I bave accomplisbed tbe delivery of clear water at tbe desired point in tbe pit by dropping the water from tbe ditcb tbrougb a line of pipe witb tbe end of the line at tbe top of the bank. If pipe is scarce flume boxes can be used to witbin a short distance of tbe face of tbe bank. This delivers the clear

Flume and Pipe Bringing Clear Water Into Hydraulic Pit.

water at tbe foot of the bank without difficulty. Tbe last section of pipe is secured witb ropes. In the course of mining as tbe bank is caved back under the end of the pipe the latter is removed, a section at a time, by aid of ropes, turning tbe water out of tbe pipe, of course, for tbe operation. The pipe back of tbe face of tbe bank sbould be well staked. (See Fig. 10.)

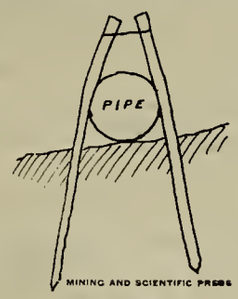


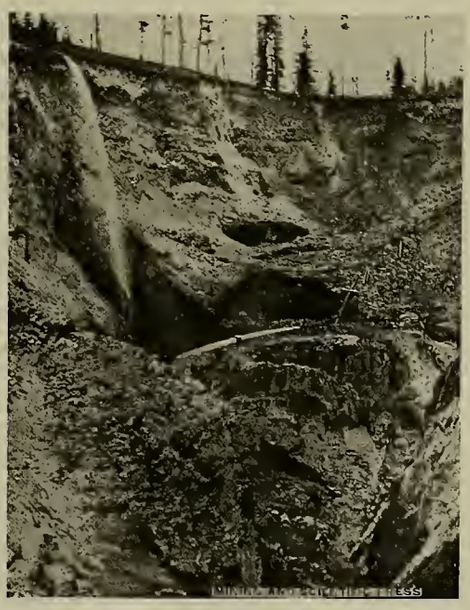
FIG. 10.

In ground where it is possible to drive wooden stakes to secure pipe and it is desirable to do so, the better metbod is to drive tbe stakes, inclined sligbtly toward each otber, against tbe sides of tbe pipe. Then tbrowing a loop of baling wire over the stakes, twist it up, tbus drawing tbe ends of tbe stakes in so tbat tbey bind tbe pipe firmly. The advantage of tbis over simply crossing the stakes saw-buck fasbion over the pipe is, tbat any strain thrown on one stake by the pipe is taken up by botb, wbetber it be a lifting or a side thrust. And of course it bolds mucb better wbere tbere is an end tbrust on tbe pipe sougbt to be beld by staking.

DRIVING BANKS VERSUS BACKING UP AGAINST THEM. — In bydraulicking compact and cemented gravels where sluice lengths, grades and drops are insufficient to properly disintegrate the material for gold saving, it is probably advisable to back up against one's bank in order to beat up and break up tbe material by driving it against tbe foot of tbe bank witb tbe giant stream. I bave no other case in mind wbere it is desirable, unless tbe topograpby of tbe bedrock is sucb as to make driving unfeasible. Yet backing up is often, and in the case of deep banks, usually done.

Regarded as a mecbanical principle it is faulty. You drive your material witb your impact stream exactly in the opposite direction from wbere you desire it to go, trusting to your dead water or mass stream flowing from tbe foot of tbe bank to pack your material to tbe sluices against all your endeavors witb tbe giant. I bave in fact on good sized properties actually seen the giant set alongside of and below tbe bead of the bedrock flume, where in consequence every pound of material bad to figbt ratber than be assisted by tbe giant stream every foot of the way after tbe material left tbe foot of tbe bank until it reached tbe flume bead. Furtbermore, wbere your bank is more or less difficult to cut and cave fast enougb for your water to be kept busy washing, you constantly tend to bave tbe foot of tbe bank wbere you wish to do your piping covered witb a pile of boulders and coarse material. All material tbat is worked away from tbe foot of tbe bank is tediously "whipped" or "winged" out at rigbt angles, or worse than rigbt angles, to tbe desired course or "rusbed" or "flooded" out by tbrowing tbe pipe stream over tbe top of a cave, tbus forming a reservoir back of it. Tbis winging or flooding is conducted over the more or less flat bedrock where the water, unconfined by cbannels, spreads out and, for sucb grade as it may have to work on, does little execution. As a matter of fact it almost figures out tbat tbe material reaching tbe sluices does so because it can't be belped.

On tbe other hand, where your work is so planned tbat you can pipe toward your sluices and drive your material, as soon as your cave is down every ounce of pressure in your pipe stream is available to drive your gravel toward tbe flume or into tbe races sbot up through tbe bedrock, where the water being confined is able, effectively, to carry tbe material to tbe flume. Tbe greater effectiveness of tbe pipe stream used in tbis way allows one a greater proportion of time to be used in undercutting tbe bank and likewise allows one to keep tbe foot of the bank driven free of boulders. Furtbermore, it enables you to bandily drive out large boulders, stumps and logs to sucb distance from tbe foot of tbe bank that tbey may be safely attacked and worked up by tbe rock rustlers, instead of being constantly beld back against tbe foot, wbere it is unsafe for a man to approacb them. Still again, it enables you to cave your ground abead of and away from your giant, provided you keep tbe point of the breast worked off diagonally abead of you, instead of squared out.



Hydraulic Mine Pit.

In sballow ground workings in creeks and gulcbes, driving your ground always toward your flume is tbe common process, accomplisbed by taking a race up tbrough the middle of a block of ground, setting your giant on tbe surface of tbe ground in bebind tbe block, inclining down to bedrock, and taking down one side of tbe gulcb to the flume head at a time. In ground of any deptb tbis process is not feasible owing to inability to incline down safely and to handle a race between deep banks of gravel.

In an endeavor to be able to break and drive my ground toward my sluices I bave used several plans. One tbing tbat binders tbe easy accomplisbment of tbis in deep ground is tbe fact tbat re-entrant angles in the banks are extremely dangerous points to place tbe giants or men, and tbey are bard to avoid. Of course local conditions, sucb as grades, cbaracter of bedrock and sbape of cbannel cross-section, govern tbe plan to some extent.

In Fig. 11, witb bedrock flume brougbt up as close to the foot of tbe bank as practicable, witb bank or breast line in sbape B L 1 and tbe side race S R 1 shot up as sbown, the giant is set at G 1, and piping tbe face A B into S R 1 commenced. While the face B C is being formed tbe main race M R is sbot up to

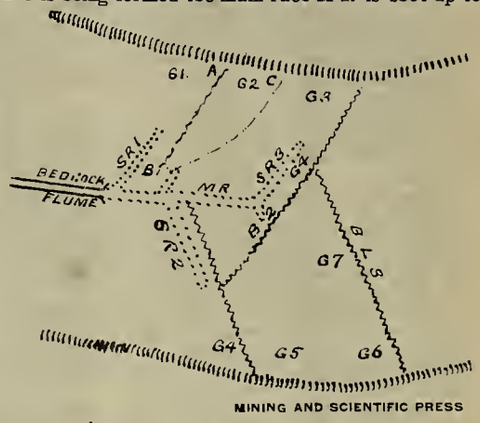


FIG. 11.

as near B L 1 as is safe and S R 2 sbot up. Tbe giant being reset at G 2, G 3 and G 4 if necessary, the gravel is driven into S R 1, M R and S R 2, and tbe pit is left in tbe sbape sbown by B L 2. As soon as main race line is passed tbe main race is sbot up and S R 3 is shot up before tbe line of tbe same is exposed to tbe giant stream. Tbe giant being tben

Gulch Hydraulic Mine Ready for Piping.

set on the otber rim of tbe cbannel at G 4, G 5, G 6 and G 7 if necessary and tbe gravel driven ahead into S R 2, main race and S R 3, tbe pit is left in the shape as sbown by B L 3, whicb is identical witb B L 1. Of course some little backing up against the bank is necessary in getting an opening at each setting of the giant, but you will note tbat the backing up is done on tbe rim wbere grade is usually ample, and tbe amount of backing up necessary is inconsequent.

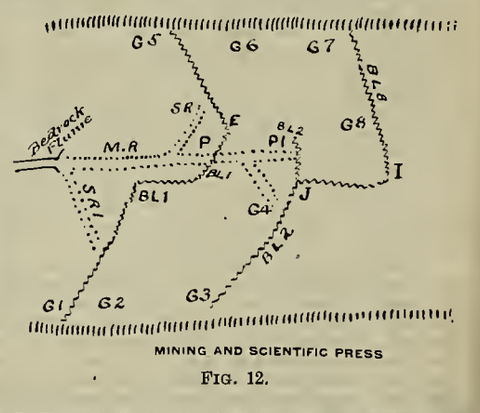


FIG. 12.

In Fig. 12 the breast line is sbaped as sbown by B L 1, witb M R sbot up to point P, witb S R 1 shot

up. As soon as the giant is set at G 1 and begins to drive ground to S R 1 and M R, men are put to work to shoot up S R 2. The giant is set successively at G 1, G 2, G 3 and G 4, leaving breast line as shown hy B L 2 and B L 1 from E to F. Giant is then reset at G 5 and M R shot up from P to P¹ and S R 3 shot up, while pit is shaped as shown hy B L 3 hy giant settings at G 6, G 7 and G 8, driving ground into S R 2, M R and S R 3. You will notice that each breast is driven across the line of the main race, so that hoth it and the side races, when the giant is moved to the opposite rim, can he shot up while protected from the pipe stream by the intervening portion of the hank, necessitating no stoppage for race blasting. The objectionahle feature to this plan possibly is the re-entrant angle in each hreast, as shown hy H I J, hut this can he so arched as to be safe in most ground.

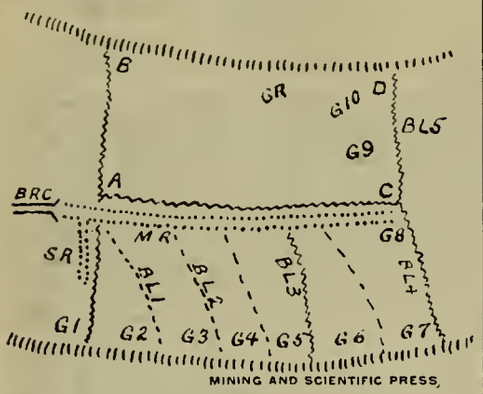


FIG. 13.

In Fig. 13 the giant set successively at G 1 et seq. to G 7 works out the hreasts to B L 4, M R and any necessary side races heing blasted up as much as possihle while giant is being reset. With the setting G 8 a turn is made and the hreast included in C A B D is driven down ahead to the flume. The objection to this plan of working is that race hlasting can not he done while piping is in progress.

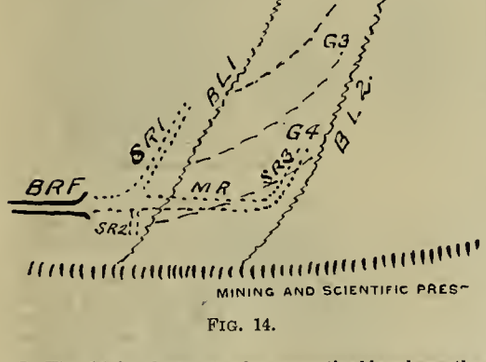


FIG. 14.

In Fig. 14 is shown a plan practicahle where the contour of the hedrock is such that the flume may be set at one side of the channel. The idea is to work constantly from one side of the channel and to keep that side worked well ahead of the other side. This idea is a modification of Fig. 11—Fig. 11 presupposing the lowest hedrock to follow the middle of the channel, and its consequently being advisahle to drive toward the middle of the channel to take advantage of the grade from side to middle. By shooting up side races to the rim and working the ground in narrow hreasts into the side races the plan shown in Fig. 14 could be used in connection with conditions mentioned in Fig. 11.

RAOE SHOOTING.—I do not attempt to square up my races when hlasting them for handling gravel. I place down holes alternately along the proposed cut as far apart as they will hreak into each other, which distance of course depends on the character of the rock. (See Fig. 15.) In decomposed schists and

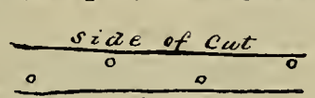


FIG. 15.

granites I drill say 4-foot holes 3 to 4 feet apart along the line and perhaps 12 to 18 inches apart across the line of the proposed cut. After blasting, we pipe out the cut, and the high places disclosed are lowered by a few pop shots. With a little assistance at critical points the gravel running through them will rapidly wear down the races into good shape. In medium or soft rock with two or three hammers at work a lot of race can he drilled and shot up in half a day, as the men can he distrihuted along the line of the cut—since no facing up is required—and all holes blasted at once, timing the shots so that they explode successively up the cut, and consequently hreak free to the hottom as much as possihle. Plan your work so that your race hlasting does not interfere with your piping and cause a consequent loss of water. If the hydraulicking interferes with the hlasting, plan to accomplish as much of the latter as possible in the intervals in piping caused by shut downs to shift giants or to clean up. The main races, worn down more or less to flume grade by the gravel washed through them, are hottomed up and squared out and the flume laid in them up to the hreast at the end of one season for the next year's run.

Effectual utilization of every available inch of water for every available moment is the keynote to the hest hydraulic mining, and all work should he planned to consummate that idea as near as possihle, hy having properly constructed ditches, well kept and vigilantly tended, properly constructed sluices, well located, the pipe line so located as to command the most ground with the fewest moves of pipe or giants, and the actual working of the pits planned far enough in advance to necessitate the minimum of shut downs for dead work in the season of good water flow.

The Electro-Chemical Industries.*

BY SAMUEL SHELDON.

The methods of electro-plating employed in estahlishments in the vicinity of New York do not differ to any extent from the methods well known in the art. The average practice may be described as follows:

GOLD.—There are three solutions in common use to give the three colors of deposit known as "California gold," "green gold" and "red gold." The salts to form the solutions are prepared by dissolving in nitro-hydrochloric acid the following alloys: For California gold an alloy of 22 parts of gold and 2 parts silver, for green gold an alloy of 16 parts gold and 8 parts silver, and for red gold an alloy of 16 parts gold and 8 parts copper. Upon evaporation the chlorides of these metals remain. They are dissolved in a solution of potassium cyanide to form the plating solution. Double cyanides are thus formed. A freshly prepared solution contains a pennyweight of gold to the gallon. The anodes are of pure gold. The articles to be gilded form the cathodes. The rate of solution of the anodes is not as great as the rate of deposition on the cathode. Therefore, the solution has to he enriched by frequent addition of the salts. The current density is adjusted hy varying the depth of suhmergence of the anode, the baths heing supplied with five volts at constant potential. The correctness of the current density which is being employed is determined by the eye and the experience of the attendant. There is no circulation of the electrolyte.

SILVER.—The solution consists of a double cyanide of potassium and silver, the concentration heing two ounces of silver per gallon of solution. The anodes are of pure silver. Owing to the tendency of silver to deposit in arhorescent crystals, the articles which are heing plated are moved backwards and forwards in the bath in a plane parallel with the anode surface. The path of movement is about 2 inches and the time required to traverse it ahout three seconds. The proper current density rests with the judgment of the attendant. Too great a density or an impoverished solution is indicated hy a violet tinge imparted to the deposit. Silver-plated articles to have a polished finish require burnishing with steel or blood stone hurnishers moistened with a solution of soap and distilled water.

NICKEL.—The solution universally employed is one of nickel-ammonium sulphate. The proper concentration results from dissolving eight pounds of the salt in a gallon of water. The solution should he kept neutral by the addition of either ammonia or sulphuric acid. The proper current density is from 0.5 to 1.5 amperes per square decimeter of cathode surface. Nitric acid should not he present in any form in the solution.

BRASS.—Much house or huilders' hardware consists of hrass-plated steel or iron. Many solutions are used. The hest, perhaps, contains equal quantities of zinc and copper cyanides or carbonates dissolved in ammonium carhonate. The color of the deposit can he varied hy varying the relative amounts of the copper and zinc salts.

CRITIOAL CURRENT DENSITY.—In the electro-deposition of metals from a salt solution, the rate of deposition which may he used is limited. If a proper current density at the cathode be employed, an adherent reguline deposit will result. If the current density he increased, the character of the deposit will change, hecoming pulverulent and non-adherent. This limit is termed the critical current density. As an increase of the permissihle current density allows of a smaller plant for the same output and shortens the time that the metal in the solution is idle, a consideration of the factors which determine the value of the critical current density is pertinent. Consider a cuhic centimeter of metal salt solution at rest and directly in front of a cathode. It contains a certain weight of the metal. The weight is dependent upon the concentration of the solution and can be calculated from its specific gravity. A certain percentage of this metal, dependent on the temperature and concentration of the solution, is dissociated and takes part in the electrolytic conduction. If an attempt he made to so adjust the current flowing through this cubic centimeter that by Faraday's laws the rate of deposition is such that all the dissociated metal ions must be deposited in one second; then it is evident the velocity of movement or migration of the ions would he one centimeter per second. Such a rate of deposition of ordinary metals from a stationary solution is impossihle. The maximum velocity of migration is rather to he reckoned in thousandths of a centimeter per second. If the deposit is to remain reguline, the ions must not he expected to migrate faster. It is possihle, however, to adjust the circuit for any current density. As soon as the rate of deposit exceeds the ability of the metal ions to supply it, hydrogen of the solvent appears to take part in the conduction and a pulverulent deposit results which contains some hydrogen and is said hy some to he a hydride of the metal. The critical current density can he increased hy increasing the concentration of the solution hy raising its temperature or by circulating the electrolyte towards the cathode.

CIROULATION.—Circulation of the electrolyte has three functions. It permits of a higher rate of deposition, as mentioned ahove; it replenishes the part of the electrolyte next to the cathode which has heen deprived of its metal; and it prevents, to a certain extent, the deposit from assuming a nodular or arhorescent form. When deposition is taking place at moderately large current densities, accidental differences of concentration occur in the vicinity of the cathode. Places on the cathode, which can he reached hy current flowing through the more concentrated portions of the electrolyte, will receive a heavier deposit than other places. As a result, they will protrude slightly from the cathode. These unevennesses are multiplied and magnified as the deposition continues.

DISSOCIANTS.—The water of an ordinary electrolyte performs two duties: First, it acts as a solvent, whereby it allows and facilitates the uniform distribution of the dissolved substance throughout the solution, suhdivision of the suhstance heing carried to a condition of a molecular fineness. Secondly, it acts as a dissociant whereby some of the molecules of the dissolved suhstance are split up and dissociated into their component ions. Without dissociation there can be no electrolytic conduction of the current. Besides water, the following suhstances are common solvents and dissociants: Liquid ammonia, ethyl alcohol, methyl alcohol, glacial acetic acid and pyridin. The last-named contains no oxygen, and it has heen recently shown hy Dr. Kahlenherg that from a solution of lithium chloride in it, pure metallic lithium may be electrolytically deposited.

COPPER REFINING.—Refined copper constitutes the most valuahle product of all the electro-chemical industries. The processes of producing the refined copper from its alloys have heen well described hy Badt, in the ninth volume of the Institute's puhlished "Transactions." The copper alloy or blister copper is cast into slabs, which are used as anodes in a hath containing a slightly acidulated solution of copper sulphate. This electrolyte is kept in continuous circulation. Pure copper is deposited from the solution upon pure copper cathodes at a current density of from 15 to 25 amperes per square yard. Copper is simultaneously dissolved at the anode and the alloyed gold, silver and other metals drop, as slime, to the hottom of the cell, to he parted and recovered later. After deposition, the cathodes are melted up, poled and cast into wire hars or other suitahle forms. The "poling" of copper consists in stirring the molten metal with a pine stick. The stick carbonizes, and, as a result, reduces cuprous oxide whioh is present in the molten copper. Upon cooling, the cuprous oxide gives up its oxygen to metallic impurities which may he present in the copper. As the mechanical and electrical properties of copper are hetter when impurities exist in the form of oxides, rather than as metals, the proper amount of poling is when just sufficient cuprous oxide is left to oxidize the impurities. Overpoled or underpoled copper is hrittle and of inferior conductivity.

PARTING OF GOLD AND SILVER.—This is accomplished hy means of electrolysis very satisfactorily in the following manner: The alloy of the two metals constitutes the anode and is placed in a linen hag. The cathode is a thin sheet of pure silver. The electrolyte is at first a $\frac{1}{10}\%$ solution of nitric acid, which ultimately becomes a dilute solution of silver nitrate. With a current density of 33 amperes per square foot silver 999.5 per mil fine is deposited on the cathode in the form of beautiful crystals. These are mechanically scraped off and allowed to drop to the hottom of the cell. Gold, in the form of mud containing some silver, colleots in the anode bags. The silver is re-

*Condensed from paper read at the 162nd meeting of the American Institute of Electrical Engineers, New York, Feb. 28, 1902.

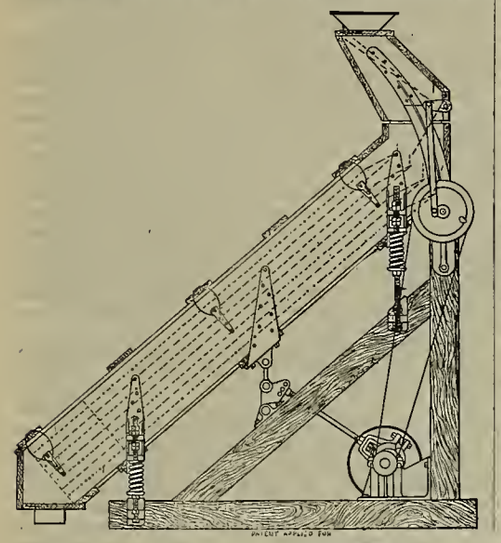
moved from it hy dissolving in nitric acid, leaving the gold in a very pure condition.

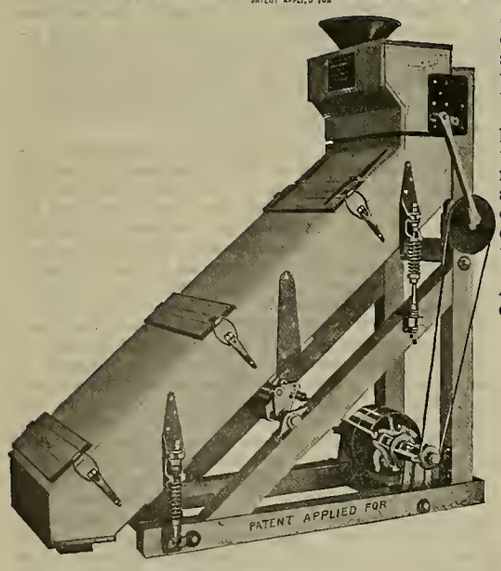
EXTRACTION OF GOLD.—The Siemens-Halske process, which is in use in South Africa, consists in dissolving the gold from the crushed ore in solution of cyanide of potash, and then subjecting the solution to electrolysis with iron anodes and thin sheet lead cathodes. The anodes are dissolved. Dr. Keith improves upon this process by adding a small amount of soluhle mercury salt to the cyanide solution. It increases the rapidity of solution, and mercury is deposited alongside of the gold on amalgamated copper cathode plates. The amalgam is scraped from these plates and the gold and mercury separated hy "retorting."

EXTRACTION OF NICKEL.—By the Hoepfner process the nickel ores are first roasted, crushed and leached in a mixed solution of cuprous chloride and calcium chloride. By electrolysis with carhon electrodes the copper is removed from the solution. The lead and iron are removed by chemical means. There then remains a solution of nickel chloride. This is electrolyzed and the nickel deposited upon a nickel cathode.

Sturtevant Toggle Separator.

The Sturtevant Mill Co., of Boston, Mass., has made special studies of screen constructions, herewith illustrated, and claims to have effected important improvements in inclined screens. Their separators have four screens (48 square feet in all),





Sturtevant Toggle Separator.

placed and firmly held, one over another, in a strong hox 2 feet wide, 6 feet long. Each screen is a substantial construction, and easily handled, for it is small. Each receives equal feed, evenly spread over the wire surfaces. One outlet discharges the tailings, another the fines. No conveyors are used to carry in or out, or to spread material. The screen hox is supported on springs, and shaken hy a toggle. The toggle has no lifting to do. It has only to shake, and this it does four times for each revolution of the driving pulley, which does not have to run fast, and moves so easily that little power is required.

Setting the toggle so as to vihrate the hox and its screens vertically is claimed to secure further increase in the capacity of these inclined separators. It was noticed that an inclined screen vertically shaken throws the material upon it upward in vertical lines. This could then obviously only fall hack to the point from which it started. Thus, no material could pass over the screen while in the air. It could only slide down while on the wire. Thorough screening was seen to he thus accomplished, all the surface being used.

The manufacturers say: "Sturtevant toggle separators are good, hecause they helong to a class of good things; they are the best hecause they alone have perfectly efficient screening surfaces, doing more work, lasting longer, and only occupying one-fourth the space." All inclined vihratory separators may he clothed with perforations varying anywhere from ½-inch to 200-mesh, as ordered.

Treatment of Impure Boiler Feed Waters.

Written for the MINING AND SCIENTIFIC PRESS by J. H. PARSONS.

The suhject above involves interests sufficiently extensive to demand the exertion of engineers towards the solution of its prohlems and the provision of remedies to counteract the evil effects of impure boiler feed water. The subject is partly a chemical and partly a mechanical one, and requires a study from the theoretical as well as the practical side.

Compounds and water purifiers, hoth chemical and mechanical, frequently fail to work for several reasons. Often the steam user expects and looks for too much. A successful treatment may not necessarily he a complete annihilation of all trouhles. No one compound can he made to do good work for all waters, and it is ahsurd for any one to offer such a compound for sale. Even were it possihle to prepare a standard remedy, the dose and form of application would not suit all cases. Where lime and magnesium exist in the water in the form of carhonates without sodium salts, it would he an easy matter to treat the water successfully with a simple remedy. But suppose the lime to he in the form of a sulphate and the magnesium a carbonate with a large excess of the former, the treatment could not he a success without a more energetic and thorough transformation of the salts. Then, again, in the presence of chlorides the magnesium salts change to chlorides, which, under heat, liherate hydrochloric acid, and this acts on the metal of the hoilers. This condition has to he understood, and we must determine whether it will arise when the water is heated hefore a formula for a good antidote can he devised.

In the case of iron pyrites, sulphate of copper and sulphate of iron in water under heat, free sulphuric acid is often produced in large quantities. After careful lahoratory tests, one can determine how much of the acid is formed under heat and pressure, how much of the acid will unite with the lime and magnesium contained in the water, and how much will remain as free acid. Different reactions require different remedies. The chemist must use great care in working out each formula. He must use the results of experience with hoilers with his knowledge of chemistry to make the formula a sure, economical and safe one. He must not put into the preparation anything which will of itself decompose into or form with the salts in the water a troublesome element.

An analysis of any sample of water may be correct; hut if misinterpreted, or if the final results which take place in the water under heat and pressure are misunderstood, it hecomes a matter of guesswork, and the remedy, if made, is not a scientific one, but a conglomeration of half a dozen, often more, ingredients, sent out with a hope that some one or two in the lot will do the work required.

It is only hy a careful preliminary study of the water used, and hy the use of a remedy which will precipitate each of the scale-forming salts contained

Fig. 1.—Pipe Filled With Lime Sulphate.

in the water in the form of a non-crystalline or non-adhering mud or silt, at the same time neutralizing the corrosive elements that it is possible to prevent incrustation and corrosion. By this method of treatment the rapid deterioration of the metallic sheets of the fire surfaces of the hoilers and the danger of explosion is lessened.

Fig. 1 shows a scale formation composed largely of

Fig. 2.—Magnesium Sulphate and Carbonate Scale.

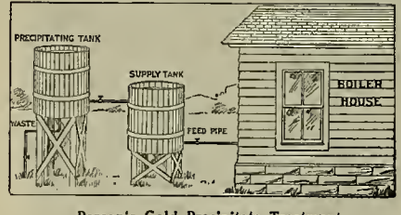
sulphate of lime. Fig. 2 shows a scale formed from magnesium carbonate and from magnesium sulphate.

For waters very heavy in salts of lime and magnesium—sulphates and carhonates—silica, iron and salt, the writer would recommend the treatment to secure the precipitation of scale-forming salts and neutralizing corrosive elements, without the aid of heat, a precipitating tank being used.

When properly treated, generally 85%—often more—of the scale-forming salts can he precipitated and all of the corrosive elements neutralized hefore the water reaches the hoilers. By doing this properly and drawing the precipitate out hefore feeding to the boilers, the trouble universally experienced when using impure feed water can be prevented.

There should he two tanks, each holding half a day's supply or more. The water from the first, or precipitating tank, after heing treated with the remedies made for this purpose, may he run into the second, or supply tank, and from this fed to the boilers, while the first tank, filled again, is heing treated and settled for the next supply. The waste pipe with stop valve should he placed in the lower extremity of the precipitating tank. One tank will answer if the supply water is drawn from it after the precipitate has had time to settle and has heen drawn off. It is easier, however, to handle the water and precipitates when two tanks are used.

The illustrations show the form of plant in use hy



Parson's Cold Precipitate Treatment.

the J. H. Parsons Chemical Co., 1509 Masonic Temple, Chicago, Ill., in their treatment of waters in which it is possihle to render boiler waters practically pure before feeding to the hoilers.

The company is treating waters ranging from 25 grains of solids per gallon to 590 grains per gallon by this system, without the aid of heat, and without any mechanical devices other than the empty tanks and pipe connections, as shown in the cut. The remedy used for precipitating in the first tank is made according to the requirements of each water as shown hy analysis.

Ten Largest Copper Mines.

Following is the list of the world's ten largest copper mines, hased on the output of 1900. They produce between them nearly one-half of the world's entire production. Seven of them are in this country, the rest in Mexico or Europe. In the suhjoined tahle their ascertained production for 1900, in pounds, is given:

Anaconda, Montana	107,000,000
Rio Tinto, Spain	80,039,680
Calumet & Hecla, Michigan	77,761,382
Boston & Montana, Montana	66,200,000
Mansfield, Germany	41,193,600
United Verde, Arizona	39,970,193
Copper Queen, Arizona	34,382,309
Boleo, Mexico	24,752,000
Mountain, California	23,956,000
Montana Ore Purchase Co., Montana	22,257,563

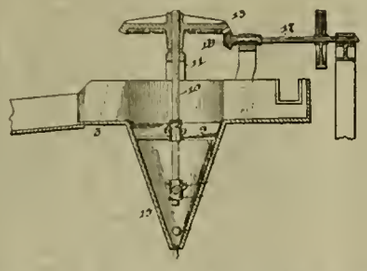
• THE African Concessions Syndicate is preparing to survey the Victoria falls on the Nyanza river, East Africa, with a view to planning a hydro-electrical power installation. The height of the falls is said to be 420 feet and the width about a mile. The syndicate estimates that the water passing over the falls is many times greater than at Niagara falls. The engineers to the syndicate are Sir Douglas Fox and Sir Charles Metcalfe. It is thought that it will be found possible to apply electrical energy generated at the falls for working about 300 miles of the Cape-Cairo railway, viz.: 150 miles north and 150 miles south. Another suggestion is that the tramways of Buluwayo, Rhodesia, which is 240 miles away, may he operated by power from this station.

Mining and Metallurgical Patents.

Patents Issued April 1, 1902.

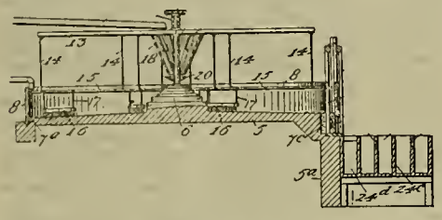
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

ORE CLASSIFIER. — No. 696,739; J. Klein, Desloge, Mo.



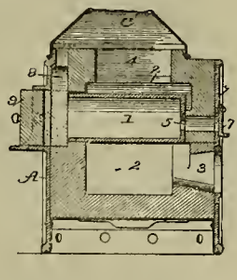
Hopper adapted to receive mixture containing ore and having ore outlet near its hottom and sludge outlet at its top, water pipe leading into hopper and directed toward ore outlet, air pipe leading into hopper below ore outlet, transversely of water pipe and directed toward sludge outlet, adjustahle agitator within hopper, driver for operating agitator, and means for automatically disconnecting agitator from driver when more ore is contained within hopper than can be discharged through ore outlet.

CONCENTRATOR.—No. 696,913; W. H. Sullivan, Denver, Colo.



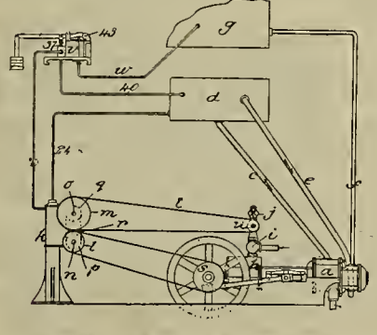
Fixed tahle having inclined surface with fixed trough ahout it deeper at one point than at another, pair of gates at deeper part of trough, gates being in different planes, pedestal 6 provided with series of steps, vertical shaft extending from pedestal and journaled therein, stationary frame 10 in which shaft is journaled at its upper end, sweeps connected to shaft, drags carried hy sweeps to move over tahle, hopper carried hy sweeps and surrounding shaft, hopper directing material on to steps of pedestal, trough for directing material to hopper and means for driving shaft.

ASSAYING FURNACE.—No. 696,548; A. C. Calkins, Los Angeles, Cal.



Combustion chamber having main top flue, muffle arranged horizontally in said chamher and having its front end open, and its rear end provided with air inlet and device for regulating admission of air thereto, means for temporarily closing front end of muffle, and supplemental flue or passage leading up from such end of muffle.

REGULATING DEVICE FOR AIR COMPRESSORS.—No. 696,504; H. C. Sergeant, Westfield, N. J., and W. Prellwitz, Easton, Pa.

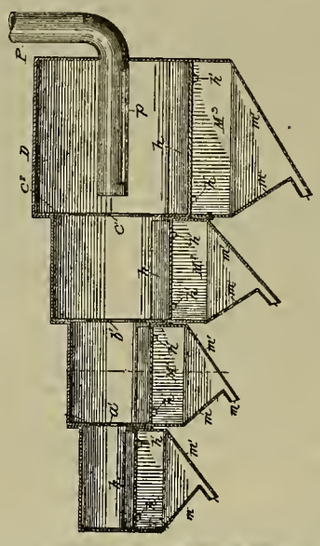


Air compressor and motor and governor for latter, of speed varying mechanism consisting of two expanding and contracting pulleys and belt between them, means for driving one pulley from motor shaft, means for driving governor from other pulley levers for expanding and contracting pulleys, screw spindle having right and left hand threads and nuts thereon for operating levers, toothed wheel on spindle, lever fulcrumed on spindle and two pawls carried hy lever for turning wheel and spindle in opposite directions, means for operating lever hy rotation of one pulley, two pawl-disengaging levers fulcrumed on spindle for disengaging pawls, and means under control of pressure of air delivered by compressor for separately operating disengaging levers.

GOLD DREDGER.—No. 696,576; T. B. Lee, Farmington, N. M.

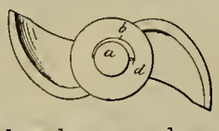
Tapering tuhular body parti-circular in length and provided with air hole in one end and with hit or hlade at its opposite end; in combination with cahles to move it forwardly, rearwardly and vertically to rotate it on its axis.

ORE CONCENTRATOR.—No. 696,604; A. H. Stebhins, Little Rock, Ark.



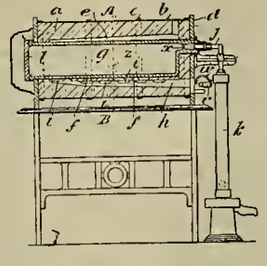
Plurality of drums of different sizes arranged in series, end of one drum heing connected to end of next larger drum of series, inlet for introducing ores to series of drums, and means tangential to drums for introducing separately into each drum independent blast of air or other fluid to cause material to circulate in curved paths within each drum at desired velocities.

CAM FASTENING FOR SHAFTS OF STAMP MILLS.—No. 696,403; A. Blanton Jr., Wallingford, Pa.



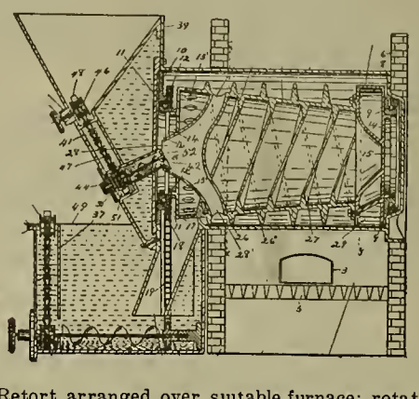
Shaft, curved wedge, secured against rotation thereon, and having outer face upon curve, radii of which, measured from center of shaft, gradually increase, and hub with opening corresponding in part with and bearing on face of shaft, and in part with and hearing on entire outer face of wedge.

RETORT FURNACE.—No. 696,456; D. Laird, Forfar, Scotland.



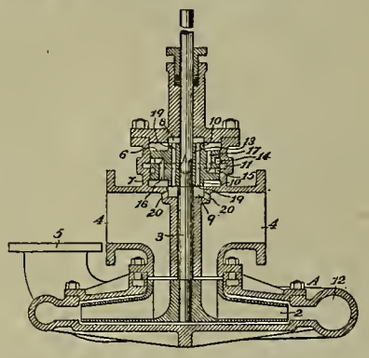
In retort furnace, retort g, dome a of fire clay, in which retort is placed; dome having helow retort inclined flame passage h, and around sides and upper part of retort, space e tapering toward end of retort, lateral passages i communicating hetween flume passage h and space e, fire clay hed f helow retort upon which it rests, fire clay hed heing supported hy dome a and hurner v w for liquid hydrocarhon or gas, and air under pressure.

AMALGAMATOR. — No. 696,452; E. J. Kiss, Fort Wayne, Ind.



Retort arranged over suitable furnace; rotatable agitator mounted in retort; means for feeding ore into retort; inlet chute, adapted to contain hody of mercury to form seal to prevent escape of mercury fumes from retort, and water seal closing outlet of retort, and in which mercury fumes of retort are condensed and amalgamated particles of precious metal are collected.

BALANCE ATTACHMENT FOR CENTRIFUGAL PUMPS.—No. 696,655; F. Ray, San Francisco, Cal.



In this device the centrifugal pump is halanced hy having the closed runner revoluble within a casing having central suction and peripheral discharge pipes. The shaft of the runner passes through a chamher, and carries a disk or plunger movable within the chamher. Suitahle passages connect the suction and discharge of the pump with this chamber, and the rise and fall of the vertically disposed shaft will open communication through grooves to either one end or other of the cylinder, and thus halance the runner and hold it essentially central between the top and hottom of the casing within which it turns.

ART OF TREATING ORES. — No. 696,469; R. McKnight, Philadelphia, Pa.

Heating with free access of air and agitation, mixture of ore containing refractory metalloid and haloid salt of alkaline or alkaline earth metal, until haloid salt of precious metal is produced and volatilized and coarser particles of precious metal have their surface coatings removed, and alkaline or alkaline earth metal unites with oxygen of air and with refractory metalloid, to form stahle oxysalt, collecting volatilized haloid or oxyhaloid of precious metals, and treating cleaned particles by amalgamation.

Assaying Sulphurets.

TO THE EDITOR:—In an answer to a question how the trouble with a method of assaying sulphurets may he overcome, you suggest roasting of the ore to he assayed. This is good, hut is a very slow and tedious process and involves chances of loss in several ways. Why not use the Aaron method? The writer has used this method for years, for all assays, and found it uniformly satisfactory. It consists in using only the amount of litharge necessary to produce the lead button desired—say 10 to 15 grams.

If there be used the full quantity of reagents taken for an ordinary assay, except litharge, and about half the weight of sulphurets (say 10 grams), with iron nails and plenty of borax, with some sand, watching the assay at the critical period, he will avoid both the excessive lead button and hoiling over, and the assay will be, in all respects, thoroughly satisfactory.

N. S. TROWBRIDGE.

Scott River, Cal., March 28.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

JUNEAU.

From the 1901 report of Supt. MacDonald of the Alaska-Treadwell G. M. Co. at Treadwell, it appears that the mines consist of three groups, the Mexican, the Ready Bullion and the Treadwell group. Together they operate 880 stamps and employ over a thousand men. The ore in these mines averaged for the Mexican $2.26 per ton, for the Ready Bullion $2.15, and for the Treadwell $2.07 and $1.80. The total operating cost of the Mexican and Ready Bullion mines for the year was $562,692.48, and the product $701,354.96, leaving a net profit of $136,662.48. The Treadwell group gave a net profit almost equal to the other two, because of the greater quantity of ore treated. Nearly three-fourths of the operating expenses are paid out in wages.

ARIZONA.

COCHISE COUNTY.

It is reported that the Calumet & Hecla Copper M. Co. has bought an extensive copper property adjoining the Copper Queen at Bisbee.

GILA COUNTY.

In a general way the metallurgical process at the Black Warrior mine, at Black Warrior, is as follows: The sulphide ores furnish their own fuel at practically no cost, and the sulphur is not wasted, as it is by the matte smelter process, but is converted into sulphuric acid, the manufacture of which costs less than a cent and a half a pound. A pound and a quarter of sulphuric acid is sufficient to leach a pound of copper. A solution of the acid and water is applied to the desulphurized ore, which is put into a vat. The solution carries off all the copper which is precipitated later by iron as cement copper, 85% pure. It is then melted into ingots and bars, this process involving the first cost for fuel. Oil is the fuel used in the melting furnace. Comparatively little water is required, for almost none is wasted in the process except by evaporation. The spent solution is pumped back into the tanks and restandardized with fresh sulphuric acid. The tailings are poorer than those obtained by any other process and contain one-half of 1%, which it is hoped to reduce to one-quarter of 1%. The plant at the Black Warrior has a capacity of 150 tons, but has so far been run at 100 tons. The labor employed is a man to run the crusher and put ore into it, four boys to open and close valves and pull levers, and two men. No chemist or assayer is required, the ore not being sorted, but treated as it comes from the mine.

GRAHAM COUNTY.

U. G. Wolfe, manager of the Polaris M. Co., has arrived at Clifton to take charge of the property. The company recently took over a group of gold claims in the Greenlee district, together with the 20-stamp gold mill at Evans Point. Work will be commenced at once on the mines, and the mill repaired.

The copper leaching plant recently erected and put in operation by the Williams-Blake Leaching Co., on the Gila river, above Safford, is reported to be doing satisfactory work. The product of one day's run is 900 pounds of 90% copper. A furnace has been erected for melting the copper into bullion 99% fine. The ore is hauled from the mines a distance of 7 miles for $1.25 a ton, and the mining is very cheap, the ore being blasted from open cuts. The ore used averages from 4% to 6% copper. The capacity of the present plant is about twenty tons daily.

MOHAVE COUNTY.

After a close-down of two months the Tennessee mill at Chloride has resumed operations. During the idleness of the mill H. N. Batsford, Supt., has kept a few men at work in the mine and has opened up some new and rich veins of ore, one of them being an extension of the Schuylkill vein, 600 feet north.

R. J. Holmes has bought the interest of C. J. Rhodes in the Homestake, Golden Era and six other mines in the Boundary Cone country, near Kingman. It is understood that he contemplates the erection of a milling plant on Silver creek, in the San Francisco mining district.

The Ben Doran mine, in Boundary Cone district, near Kingman, owned by J. D. Lane and M. F. Wilkinson, has been sold for $15,000 to Bauman Bros. and E. B. Smith of Fremont, Ohio. The mine was recently located, and the new owners propose to develop the property and to put machinery on the ground to begin sinking the shaft.

PIMA COUNTY.

A rich strike is reported in the mines of the Consolidated G. M. Co., in the Guijas district, near Arivaca. The vein on the first level has developed to 6 feet wide, and much of the ore is claimed to go over $100 to the ton. Dr. Galusha Anderson, of Chicago, Ill., is president of the company and C. E. Tolman superintendent. The company has just installed a mill to treat its ores.

M. Lulley has discovered a large body of gypsum about 20 miles west of Tucson. It is stated to be of a superior quality and desirable for cement manufacture. The mine is to be developed.

PINAL COUNTY.

F. W. Force of the Bob Tail M. Co.'s gold mine, near Ray, says a strike of very rich ore was made in a winze from the lower level tunnel, about 200 feet from the surface. The stamp mill has been started for a preliminary run on low-grade ore. J. F. Force, president of the company, is arranging for the building of a smelter and concentrating machinery for the company's copper mine.

YAVAPAI COUNTY.

Superintendent Henderson of the Rochester M. Co., operating properties at Placeritas, says the company will soon put in hoisting works, sink 300 feet and erect a 10-stamp mill.

Salinger & Yeaton, owners of the Victor mine, near Prescott, M. S. Taft, Supt., propose to soon erect a stamp mill at the mine.

The Murphy group at Gilbert, O. H. Perry, manager, is to be started up soon. The company is considering the erecting of a mill.

A solid body of ore carrying good values in copper, gold and silver, has been opened in the Copper Basin mine. The find was made at a depth of 100 feet. The property is owned by the Copper Basin G. & C. M. Co. of Prescott.

C. W. Platt, of Prescott, is said to be planning to build a mill for his mines on Kirkland creek.

The Big Five Placer M. Co., near Prescott, will install two gasoline engines, one to pump and one to run the placer mining machinery on the gravel drifted out.

The Niles M. Co., at Groom creek, is putting up several mine buildings, including five bunk houses, one large cook house and dining room, an assay office and two or three cottages. The company expects to build a mill as soon as the 500-foot level is attained. At the 300-foot level they have 800 feet of drifts. A large station pump is being installed.

The Groom Creek G. M. Co., at Groom Creek, S. Jones Supt., is down with its shaft to the 200-foot level, and will continue to the 500-foot.

The Midnight Test mine, at Groom Creek, has started up.

YUMA COUNTY.

Dr. Geer, general manager of the Arizona Dev. Co., operating at Harrisburg, says that a ledge of free-milling gold ore 8 feet wide is exposed in the bottom of the 300-foot shaft of the Mineral Belt mine. A shipment of four tons of ore yielded $88 per ton gold.

CALIFORNIA.

AMADOR COUNTY.

J. F. Parks, Supt. of the South Eureka mine at Sutter Creek, states that he is sinking the main shaft below the 2000-foot level, and will sink the shaft at least 200 feet before starting the new levels.

At the Fremont, E. C. Purrington Supt., the grading for the new hoist is finished. Concrete piers have been built for the framework. Some of these piers rise 24 feet from the ground to a level with the collar of the shaft. The top of the gallows frame will be 84 feet high from the collar of the shaft. This building is also of galvanized iron and 40x70 feet in dimensions. It is calculated that the hoisting machinery will be in running order in from sixty to seventy days. It has been definitely decided to erect a 60-stamp mill, work on which will be commenced to have it in running order if possible by September next. These large surface improvements are the outcome of developments in the mine run at the depths of 600 and 700 feet. An immense ledge has been encountered in the 600 and 700 levels, the quartz at the 600 level showing 110 feet in width.

L. P. Harvey is superintending the operations of the Buena Vista C. M. & R. Co. at Ione.

BUTTE COUNTY.

A Colusa company is prospectiug at Bidwell's Bar for the ledge from which the rich placers mined in early days are believed to have come.

The growth of the dredger mining industry at Oroville has been so rapid that in four years the capital that is invested in the dredger district, comprising about 5000 acres of the valley of the Feather adjacent to Oroville, has grown from practically nothing at all to more than a million dollars in machinery alone. There are at present fourteen dredgers at work, while six more are building or contracted for. These machines represent an outlay of about $50,000 each, or a total of $1,000,000, while machine shops and other equipment raise the total considerably. The Lava Beds Dredger Co. have, in addition to a dredger, a steam shovel for removing top dirt, with a full equipment of track, rolling stock and power for moving it away. The Feather River Exploration Co. has a large machine shop, the Marigold Co. has another, and a third—larger than the others—has just been built at Oroville at a cost for building and equipment of $30,000. In addition to the twenty dredgers that are built and building, several more are in contemplation, and it is probable that contracts for four or five more will be let within a short time. The companies operating dredgers are as follows: Feather River Exploration Co. owns 1200 acres of land, has three dredgers at work and two more building; Boston & Oroville Co. owns 643 acres, has three dredgers at work; Oroville Gold Dredging & Exploration Co. owns 360 acres, has one dredger; Oroville Gold Dredging Co. has 50 acres and one dredger; Indiana Gold Dredging Co. has 134 acres of land and one dredger; Lava Beds Dredger Co. has 300 acres of land and one dredger; Legget-Wilcox Co. has 350 acres of land and one dredger; Marigold Gold Dredging Co. owns 462 acres and has two dredgers; Kia Ora Co. has 153 acres and one dredger; Pennsylvania Gold Dredging Co. has 155 acres and is building a dredger; American Gold Mining Co. has 73 acres of land and is building one dredger; Butte Gold Dredging Co. has contracted for one dredger; Cherokee Gold Dredging Co. has 400 acres of land and is building one dredger; Sunset Gold Dredging Co. has 110 acres of land. The companies that are known to be contemplating placing contracts for more machines are the Legget-Wilcox Co., the Boston & Oroville Co., the Oroville Gold Dredging & Exploration Co., the Lava Beds Gold Dredging Co., the Cherokee Gold Dredging Co., and the Indiana Gold Dredging Co.

The Butte G. Dredging Co. of San Francisco has been incorporated, capital $200,000, to operate near Oroville. The directors are S. P. Connor of Alameda, J. S. Grant and W. S. Wood of San Francisco, and W. S. Noyes and B. Noyes of Oakland.

The Valley Power Co., which bought the Cherokee ditch and water system, is to build a new reservoir 5 miles above Magalia. The reservoir will have an earth dam and cover twenty acres; the water will average 25 feet deep. The water will be taken from it in an iron pipe, 30 inches in diameter, down to Butte creek. The distance is about 1½ mile and the fall is 1600 feet.

CALAVERAS COUNTY.

The Benson M. Co. has been incorporated, with office at Stockton, with directors J. C. Benson of Santa Cruz, C. E. Colby and C. H. Fairall of Stockton and N. Anderson and J. Anderson of Angels. The company will operate near Angels.

The shaft of the Fanny Marie mine at Glencoe will be put down another 200 feet. Additional machinery for all the works and also a 20-stamp mill will be erected.

On the Sugar Pine mine, near Angels, owned by the San Joaquin M. Co., H. F. Stewart Supt., there is now a 100-foot shaft and a 30-foot crosscut at the bottom. Five stamps of the mill are kept working on ore from the upper tunnel.

DEL NORTE COUNTY.

T. W. M. Draper of San Francisco, manager of the Waldo S. & M. Co., says that his company will begin at once the work of surveying a railroad route from Waldo to Crescent City. The first survey will be made from Waldo to Crescent City, and if the people of Grants Pass show a disposition towards it a later survey will be made from here to Waldo, completing the route through to the coast. The railroad will be standard gauge. It will be built by the same people as those connected with the Waldo S. & M. Co. The new road will be known as the Oregon & Pacific.

EL DORADO COUNTY.

J. C. Moore of Garden Valley is making a test run on ore from the Bright Hope quartz mine with a 2-stamp mill.

J. M. Nougues Jr., Supt of the Josephine mine, says that the work of retimbering tunnel No. 5, preparatory to installing power drills, is completed.

INYO COUNTY.

What is said to be a nugget of platinum has been sent from Coso valley.

MONO COUNTY.

The Blue Vein mining property, near Bodie, has been bonded to Eastern parties at $100,000, the first payment of $20,000 to be made in sixty days.

MONTEREY COUNTY.

Monterey county may have another Klondike. The hills and mountains of the Coast Range near Point Gorda are claimed to be exceedingly rich. The new gold fields are in the southwestern part of Monterey county, about 2½ miles from the Pacific ocean. A number of San Francisco people have organized the Ralston G. M. Co. and have bought 1060 acres of placer claims. A pipe line a mile long, a ditch and three giants form the hydraulic plant. The first three weeks' run produced gold valued at $2200. One nugget is worth $216, another $186 and a third $120. One of the specimens has some quartz attached to it. The tailings flow into the ocean. It is claimed that the black sand found in the sluices will yield $102 a ton. The district can be reached by way of King City and Jolon, with 10 miles travel by wagon and 15 miles of mountain trail. Steamers can land passengers at Point Gorda, which is only 2½ miles from the mines. Primitive mining has been going on in the district for many years. Water is said to be plentiful in the new district, and if investigation proves that more hills than one are rich in gold a rush will likely result.

NEVADA COUNTY.

Supt. Hosking will rebuild the hoisting works at the Eclipse mine, Gold Flat.

The Manhattan mine on Gold Flat, near Nevada City, owned by G. W. Baldwin, has been bonded to H. J. Griffin and F. Du Bois of San Francisco. They propose to commence work sinking and, should the indications prove favorable, will erect a hoist.

Manager Lezinsky reports that fine progress is being made in removing the Reward machinery to the California shaft. It is expected that inside of a month's time the machinery will be ready to commence pumping out the mine.

At the Grass Valley Con. mine, near Grass Valley, Supt. Coffin hopes to be running ore through the mill by the 20th inst. L. M. Hall, consulting engineer for the company, is superintending the installation of motors and the foundation for a 4-drill compressor.

J. C. Campbell is reopening the Murchie mine at Nevada City. The tunnel will be cleaned out and the shaft, which is down 140 feet, will be retimbered.

Dr. Sponogle and associates of San Francisco and the East will commence work on the Monarch mine, near French Corral. The operators have in view the erection of a mill in a few months.

PLACER COUNTY.

At the Pioneer quartz mine, near Towle, twenty-two men are now employed. An upraise of 347 feet has been made connecting the lower with the No. 2 tunnel. A. P. Chittenden is Supt.

SACRAMENTO COUNTY.

J. H. Canard, Supt. of the Prosperity Gravel M. Co. at Folsom, is in charge of the opening of a new drift mine on the Cohn ranch. The shaft is ready for hoisting machinery, and mine buildings will be erected immediately.

SAN LUIS OBISPO COUNTY.

A cinnabar ledge is reported extending from the San Carpojo, on the Monterey county line, to the Rinconada, near Santa Margarita. At Pine mountain the American Exploration Co. is blocking out ore in its mines preparatory to the erection of reduction works.

The Oceanic Quicksilver Co., a Los Angeles corporation, has blocked a body of ore. The company has a 48-ton furnace and a wire tramway connecting it with the mine, 5 miles from Camhria.

The old Josephine mines are being worked by the California Con. M. Co. of Kittery, Me.

Between the mines above named and the Karl Quicksilver M. Co.'s properties are a number of claims being developed by L. G. Sinnard.

The Karl Quicksilver M. Co. has completed a 60-ton furnace, and is reported to be producing 200 flasks of quicksilver per month. There are fifty men employed. A small town has grown up around the mine, and is known as Klaw postoffice.

SHASTA COUNTY.

The Texas G. M. & P. Co., now operating the Texas mine at Whitehouse, is installing an air compressor plant, which will be operated by electric power. It is reported that a rich strike has been made in the Texas shaft on No. 5 level.

A. Carlson of Keswick has bonded a claim on Flat creek to San Francisco people for six months.

J. Chambers of Keswick is doing some prospecting and development work in Flat creek district.

S. Bamberger of Salt Lake City, Utah, has obtained from the Shasta G. & C. M. Co. five adjoining claims and will come to DeLamar personally to inspect them.

President and General Manager W. F. Mitchell of the Shasta G. & C. M. Co. of Salt Lake City, Utah, is starting up work

on the company's claims in the Brushy canyon country, near DeLamar. A shaft will be sunk 100 feet and later, if the showing of copper developed is satisfactory, the company will erect a smelter.

The forces at the Mountain Copper mines and smelters have been enlarged and five full train crews have been put on the Iron Mountain Railroad.

SISKIYOU COUNTY.

J. H. Schroeder of Yreka intends putting up a stamp mill on his new mine at the head of Deadwood creek.

The Pine Grove placer mine at Buckeye Bar, Klamath river, is being operated by M. J. Whitney & Co. of Detroit, Mich., with an elevator plant. The gravel at bedrock prospects $4 to the pan.

A. Condrey has found rich prospects in surface soil and porphyry on Klamath river above Oak Bar. Ten claims have been located.

TRINITY COUNTY.

About one year ago H. Z. Osborne, U. S. Marshal for the southern district of California, bought the Dorleska mine for $5000. He organized a company and in one season, with a little sampler, ran through 756 tons ore that returned $35,-209.93. This wasn't away off in Arctic night and darkness among isolated inconvenience, but in California, where in each of the thirty-nine mining counties are equal opportunities for a little capital.

TUOLUMNE COUNTY.

Work on the Bed Rock blue gravel claim on Table mountain at Sonora is being pushed by C. L. Lang and associates. A cabin, blacksmith shop and changing room have been erected. The upper tunnel will be opened up and the channel tapped. It is estimated that when the gravel is struck it will open up about a mile of old river bed, which can be drained and worked through this tunnel.

The report of the manager of the Jumper mine at Stent to the shareholders' meeting in Glasgow, Scotland, last month, showed gross yield of the mine in 1901 as $417,300.46. The 60-stamp mill was run eleven months and 54,344 tons of ore were crushed. The balance sheet shows a profit of £32,019 8s 6d. The ore reserves in sight were estimated at 155,575 tons, an increase of 51,838 for the year.

The Republican mine at Jacksonville is to have ten stamps added to its mill. A chlorination plant is also under consideration. The mill produces daily two tons of sulphurets going $50 to $60 per ton and a saving is anticipated by working them at the spot.

A two-compartment shaft, 75 feet deep, has been sunk in the placer claim on the Doyle ranch, Columbia. It is estimated that some 50 feet more will be required before the gravel is reached. Machinery for pumping and washing gravel is to be installed.

The 20-stamp mill on the Dead Horse mine at Carters has been started up. Hugh Smith is in charge of the mill.

The Soulsby and Draper Mining Companies at Soulsbyville intend to use oil instead of wood for fuel. Wood is claimed to be cheaper, but the companies will not have to tie up money in a large supply of wood for use during the winter.

Work has been partially suspended in the Lost Fox mine at Carters until the mill is completed. The saw mill is at work cutting out timber.

YUBA COUNTY.

Supt. Matthews has men at work at the old Sweet Vengeance quartz mine, 2 miles west of Brown's Valley, where he is installing machinery to reopen the mine. A company of Eastern people has bonded the claim and with cheap power and improved machinery will endeavor to work it at a profit. The mine has been closed for thirty-six years.

COLORADO.

BOULDER COUNTY.

A pay streak 30 inches wide, showing tellurium and sylvanite, has been uncovered at the 250-foot level on the Lucky Star lode at Wall Street. The property is owned by R. A. Duncan, C. H. Cheney and C. H. Wise, all of Boulder.

The Colorado & Northern G. M. & M. Co. has opened up a vein of grey copper ore in the 1330 drift from the Dirigo tunnel at Ward. The vein is 2 feet wide and lies on the north wall of a 22-foot porphyry dyke that averages about $4 per ton in gold. The tunnel is over 2100 feet long and in running that distance several veins assaying from $4 to $30 per ton in gold have been crossed.

A strike is reported in the Lucky Star mine at Wall Street, owned by R. A. Duncan, C. H. Cheney and C. H. Wise, all of Boulder. In the 250-foot level the ore vein is 30 inches wide, tellurium predominating, 4 inches of it running from $35 to $40 per pound.

CHAFFEE COUNTY.

The Sunrise group of eleven claims situate in the Four Mile mining district, near Salida, has been bought by the Sunrise G. M. & M. Co., capital $750,000, incorporated by J. Weinstein, P. Mauro, N. Golforb, P. W. McCraffey, of Denver, and A. A. Mauro of Chicago, Ill.

CLEAR CREEK COUNTY.

Operations have been resumed on the Conqueror mine at Georgetown by Milwaukee, Wis., people, who recently bought a controlling interest from Mr. Wells. A Mr. Brown of Leadville is in charge of the work.

An average of 4 feet and 9 inches per round of holes was made in the Empire tunnel at Georgetown in March through extremely hard rock. Considerable trouble has been experienced in getting trammers to stand up to the work in removing the large amount of rock that is broken with each round of shots, a couple of shifts with drills being lost on this account. The first of April G. Lucas and R. Kelly made a contract to tram for 1000 feet at $2 per foot.

The Maxwell mill at Silver Plume, recently bought by Supt. Olds of the Mendota, has been started up with W. Jewell of Denver in charge of it.

J. W. Boughton of Philadelphia, Pa., has bought the interest of F. L. Miller in the Bimetallic group of claims, near Silver Plume, and expects soon to begin active operations and install a plant of machinery.

The amount of ore produced and treated at the mills in Georgetown in March, 1902, exceeded the production of March, 1901, by almost 50%, both in tonnage and value.

J. H. Pape and H. H. Dorsey have bought 104 acres of mineral lands near Idaho Springs, for $50,000, from W. Lewis and John Palmear, who have held the property twenty-five years.

The Newhouse tunnel at Idaho Springs has been closed down after it had reached a total distance of 13,220 feet, the cost of which amounts to $228,328.22. It is stated that there is a business difference between the Newhouse tunnel and the mine owners whose properties it penetrates. The tunnel has cut 103 veins carrying ore, and at present but three properties are working their veins.

The Gold Cord M. & S. Co., which for the past six months has been driving a drainage and transportation tunnel at Kokomo, has bought the Lexington group of mines on Soda creek, near Idaho Springs, and already have men cleaning up the old workings and extracting the ore.

C. H. Stevenson, owner of the Little Johnnie and Hamilton groups of seven claims on Soda creek, near Idaho Springs, has 700 or 800 feet of workings on the property, and is making arrangements to resume work after an idleness of several years. He intends to sink a shaft 200 feet.

The Seaton Electric Co. has completed its new auxiliary plant, near Idaho Springs, and the full capacity of the new plant has already been contracted for. The plant was built with a view to furnishing power for the mines of the district, but the power is all taken before the lines get to the mines.

EAGLE COUNTY.

A company has been formed in Denver to do extensive development work on his Horn Silver Mountain mine at Red Cliff. M. Edwards is Supt., and has called for bids on sinking the incline shaft 200 feet. The company will furnish the machinery, timbers necessary and take care of the water.

GILPIN COUNTY.

The Tucker mine, in Quartz valley, near Central City, has been sold to Chicago people by W. Woods for $150,000. This is the mine from which the lead ore was taken that furnished the First Colorado Regiment with lead for use at the breaking out of the War of the Rebellion in 1861. Many new improvements will be made on the surface of the property by the new owners.

The Gauntlet G. M. Co. has let a contract to sink the Gauntlet shaft in the mine at Central City another 100 feet, its present depth being 165 feet. Some fair grade lead and concentrating ores have been taken out in the bottom levels. Iowa parties are the owners and operators.

The air compressor formerly used on the Waterbury adit has been removed and installed in the Mammoth mine, near Central City. The company, composed of Chicago, Ill., and Colorado people, intend sinking the shaft from the 700-foot level to the 1000 point.

J. W. Ray of Cripple Creek has bought the After Supper mine at Black Hawk for Cripple Creek and Massachusetts people, the price being about $20,000. The former owners are W. Fick of Black Hawk, T. De Coar of Idaho Springs and J. Bitzer of Leadville. The new owners will, it is reported, put on a heavy plant of machinery, erect a larger shaft building, and will prosecute developments on an extensive scale.

GRAND COUNTY.

The High Lonesome G. M. & M. Co. has been incorporated by Denver people with W. E. Rammell secretary and treasurer and H. C. Merlick president. On one of the properties in Grand county a body of ore 25 feet wide has been opened up, giving an average assay running $8.18 per ton. The ore runs well in copper.

HUERFANO COUNTY.

Supt. D. M. Murray of the McMillan mines at Bianco is installing the machinery for a concentrator, which will have a capacity of forty tons a day to begin with.

LAKE COUNTY.

The 1901 reports to the meeting of the new Leadville Home M. Co., at Leadville, show it to be the largest proposition operating in the down-town section of Leadville. The company produced 81,000 tons of ore during eleven months, and also did a large amount of new development work. The receipts were $301,000, the expenses were $224,000. The company paid $112,-000 in dividends during the last nine months of 1901. Owing to the smelter conditions at the present time, they have been compelled to curtail shipments.

MONTEZUMA COUNTY.

(Special Correspondence.)—The latest gold camp in Colorado to attract the attention of the mining world lies in the La Plata mountains in the southwestern corner of the State. Here a strike of 20-ounce ore in the abandoned Neglected mine, which was quickly reported about the country, drew attention to the fact that J. Doyle, the locator of the Portland at Cripple Creek, has had an agent in the district for nearly three years investigating and buying an extensive group of claims. His properties lie at the head of East Mancos river, some 16 miles northeast of Mancos, the supply point. Two of the claims, the North Star and the Sundown, had been worked by storekeepers and ranch hands to the extent of two adits about 200 feet in length and about half an acre of ground stoped out. Part of the ore was smelted and part worked in a steam stamp mill, and values amounting to about $60,000 were recovered from this one stope, an average of over $40 per ton.

The ore here is a blanket formation at the contact of lime and quartzite, varying in thickness from 2 to 10 feet, but this deposit is cut at frequent intervals by vertical fissures, some of which have been opened up by prospect holes and short adits, showing good ore.

Mr. Doyle has built offices, laboratories, bunk houses, cook house, commissary, shop, ore bins, etc., and practically completed a 10-stamp combination mill, which will be started in the early summer. This is designed as a testing plant, it being the intention to build a large mill as soon as the most economical method of treatment has been worked out. These mines are being operated under the name of the Mancos Con. G. M. & Dev. Co., with P. J. Lonergan manager, and R. H. Toll Supt.

The formation contact has been traced for 15 miles, yet not three holes have been made on it beyond daylight, nearly all the work done in the district being confined to that required as the annual assessment, it being customary to make a different opening each year to indicate the amount of work. Fully 200 square miles is known to be gold bearing, the district showing 1000 to 10,000 colors to the pan, but it has never been half prospected, and there is room and work for an army of prospectors.

The region is well wooded and watered, the climate is excellent, and a good wagon road extends to the very heart of it. The season lasts fully six months and it is an ideal spot for outdoor work. It is likely that many will come here this summer, but they should not go too early, as the season is late and little can be done before the middle of May. Supplies and outfits may be purchased at Mancos, from which point a stage runs to the mines twice a week.

Mancos, April 2.

OURAY COUNTY.

F. Baker of London and J. H. Hammond of New York have been making an examination of T. F. Walsh's Camp Bird mines at Ouray, and it is reported that the mine will be sold.

The Genessee-Vanderbilt group of five claims at Red mountain has been sold for $25,000 to the Bluebell M. Co. The mines are worked through two tunnels, one being in 800 feet and the other 300 feet.

The Ceramic M. & M. Co. of East Liverpool, O., has bought the Box canyon group of four mining claims at Ouray and has begun development work. The claims are all on the same blanket vein and extend up the southeast slope of White House mountain for 6000 feet. W. A. Hart is local agent and Supt. of the company. It is the intention of the new company to erect a mill in Ouray during the summer for the treatment of their ores, and an aerial tram of about one-half mile in length.

PARK COUNTY.

F. C. Alsdorf, manager of the Kentucky Belle mines, at Alma, has appointed a Mr. Johnson, of Telluride, Supt. of the mines. Mr. Alsdorf is expected to soon commence the erection of a mill.

SAN JUAN COUNTY.

The Gold Tunnel & Railway Co. has prepared for extensive operation on the Highland Mary mine, near Silverton, by installing compressors and air drills and buying lumber and machinery for a mill. It is also about to commence the driving of the Oro tunnel, which was started some years ago to develop mines in Kendall mountain at from 2000 to 3000 feet depth.

H. S. Born and U. G. Nelson have bought a half interest in the Celia Kileroy claim at Silverton. The Kileroy is developed by two tunnels, the lower one being in 95 feet and showing 3½ feet of ore which gives average returns of over $10 per ton. This season the new owners propose to run another 125 feet in the lower tunnel.

SAN MIGUEL COUNTY.

The Blue Lake M. & M. Co. has been incorporated at Kansas City, Mo., to operate properties located in Bridal Veil basin, near Telluride. At the present time the company own the Lake View, Lake View No. 2, Revenue, Argenta, Syndicate and Occidental claims. W. W. Cramer of Telluride is in charge of operations.

SUMMIT COUNTY.

The Washington property, on Nigger hill, Breckenridge, is to be reopened and worked this season by H. S. Newsom, M. G. Evans & Co., who have a bond on the property. The mill will be moved from the hill to below the railroad track, where the ore can be dumped from the Berlin tunnel directly into it. P. Mixsell, of Idaho Springs, is superintending the resetting of the mill, which he expects to have in operation by June 15th.

TELLER COUNTY.

The Independence mine at Cripple Creek was located July 4, 1891, by W. S. Stratton, and operated privately by him until its transfer to Stratton's Independence, Ltd., of London, May 1, 1899. The mine's production from 1891 to the end of 1898 is placed at 41,694 tons of a value of $3,837,360. It is safe, therefore, to estimate the gross production of the Independence to the date of transfer at $4,000,-000. Mr. Stratton was paid $10,000,000 for the mine. T. A. Rickard, the consulting engineer for the purchaser, placed the mine's reserves in 1899 at 70,000 tons, value $6,712,000. He added to his report an estimate that the mine would produce $8,000,000 from the ground then developed. The mine has produced for the English owners approximately $8,500,000, making a total gross production of approximately $12,500,000. Mr. Stratton has estimated his profits derived by operation of the Independence at $2,400,000. This he made out of a gross production of $4,000,000. The English company has paid dividends to the amount of $3,187,-000 out of a gross production of $8,500,000. The total profits, therefore, amount to $5,587,000. Stratton developed ore to a depth of 800 feet. Ore was not opened below this point by the new owners until two years after securing the property. Good ore was found at 900 feet and some at a greater depth. The shaft is now down to a vertical depth of 1400 feet. John Hays Hammond became consulting engineer for Stratton's Independence in 1901. His first report, showing not quite $2,500,000 worth of ore in sight, caused the first sensation and a big break in the shares.

A station at a depth of 1300 feet in the shaft of the Blue Bird mine, on Bull hill, at Gillett, has been started. The landing will be made 12 feet square by 10 feet. The shaft will be put down to 1350 feet, which is as deep as can be made with the present plant. The company is considering buying another plant of machinery to cost $25,000. E. S. Johnson is president.

T. B. Burbridge of Denver and G. F. Fry of Cripple Creek have taken a five-year lease on the old workings of the C. O. D. property of the Rebecca Co. at Cripple Creek, and will start operations immediately.

The new plant of the Modoc Co. at Cripple Creek is in place and operations in the new shaft on the Ocean View claim have been started. The new shaft is a vertical three-compartment and it will be put down to the depth of 1000 feet and connections made to the levels of the incline shaft now operated through.

Another strike has been made on the Laura Lee mine, on Mineral hill, in an upraise in a crosscut, at a depth of 110 feet. The rock shows free gold in large cubes and will run from $300 to $400 to the ton. S. Peterson has bought the half interest of O. Stone, and is now sole

owner. Arrangements are being made for a plant of machinery.

In the Vindicator mine a 4-inch streak of ore has been opened in an upraise from the ninth level that it is said is yielding ore running from 50 to 600 ounces to the ton. In four days $20,000 worth of the ore is said to have been taken out and sacked.

The gold output for the Cripple Creek district for March, as indicated by figures furnished by the different reduction plants and smelters, is as follows:

Plant—	Tons.	Value Per Ton.	Total.
Colo. - Philadelphia			
Standard	24,000	$33	$792,000
Union	8,500	30	255,000
Dorcas	1,500	25	37,500
Economic	4,500	35	157,500
Smelters and miscel.	14,000	56	784,000
Total	52,500		$2,026,000

The regular monthly meeting of the board of directors of the Elkton Co. at Colorado Springs authorized Supt. Henley to go ahead and discharge all the dead bones on the payroll and to cut down the force materially. Other economies will also be introduced. It came out at the meeting that the 300 men employed at the mine had probably not averaged over four hours' work a day for some months. Quantities of whisky were taken to the mine. There was a regular system of proclaiming the approach of the manager among the men, so that they might resume their work in time to escape detection.

IDAHO.

The Black Pine group of four claims, owned by the Black Pine M. Co., of which F. J. Fetter and F. W. Little of Kansas City, Mo., are leading stockholders, and G. Fetter local manager, has had a shaft sunk on the vein to a depth of 154 feet. At this depth a large volume of water was encountered and the shaft abandoned. A tunnel has been started to drain the mine. It is estimated that 2700 feet will be necessary and that the depth attained will be over 600 feet.

CUSTER COUNTY.

The miners' union at Mackay has called out all the miners and other workmen employed by the White Knob C. Co. It is stated the strike involves 1000 men.

IDAHO COUNTY.

Reports from the Consolidated Hydraulic M. Co.'s operations at Lucile and Freedom state that the company will bring an ample supply of water on to the property, which has heretofore been considered of little value because of its height. The improvements contemplated include a suspension bridge across the Salmon 225 feet high and 480 feet long, to carry 5000 inches of water on to the Fockler high bar on the west side of the river. It is expected to have this in operation this year.

OWYHEE COUNTY.

Supt. A. F. Stevens of the Addie Con. M. & M. Co., is preparing to install the machinery and electrical equipment of the new 10-stamp mill at Silver City, which it is the calculation to have completed and in operation by July 1st. An assay office and mine office is being built at the tunnel.

SHOSHONE COUNTY.

A 6-foot vein of lead and copper ore has been struck in the Sonora Co.'s property near Burke, J. F. Moffatt, manager. It is about 1000 feet from the portal of the tunnel, and approximately where the second ledge in the property was expected to be found when the work was begun.

MICHIGAN.

HOUGHTON COUNTY.

The Calumet & Hecla M. Co. is installing electrical pumps in No. 7 shaft of the Hecla branch at the 12th, 24th, 26th, 36th and 48th levels. Electrical pumps have been in use in other parts of the mine for some time, and are said to have given satisfaction. With the additional pumps in commission the entire water of the mine can be handled without the aid of the bailers at the Red Jacket shaft. Although the installation of electrical pumps to take the place of steam pumps will mean fewer men to take care of them, the men will be placed at other work.

MONTANA.

FERGUS COUNTY.

The mill on the New Year property at New Year will be shut down to permit the enlargement of the plant. A new conveyor will be put in and five new leaching tanks placed in position, which will increase the capacity of the mill from 50 to 200 tons per day.

F. A. Case, lately Supt. of construction work on the automatic tramway at the New Year mine, is prospecting in the South Moccasin section, near New Year. Samples of cyanide ore have been assayed with satisfactory results.

FLATHEAD COUNTY.

G. H. Shawler, manager of the Mustang Consolidated Mines Co. of Spokane, says the prospects for his company putting in a mill this summer are encouraging. The company own three claims in the West Fisher gold belt and the principal work so far has been done on the Mustang claim. The vein is about 4 feet wide and carries values in free milling gold. In the vein is a foot streak of ore which goes over $100 in gold.

GRANITE COUNTY.

The Hope mine, near Phillipsburg, has been bought by the Granite-Bimetallic M. Co. President P. A. Fusz of the latter company will be president of the new Hope Co. Operations will be resumed in the mine.

MADISON COUNTY.

It is reported that the Revenue-Monitor and the Columbus groups at Richmond are to be consolidated, together with some twenty-five or thirty new and old locations. It is also thought that the Kennett and Kearsarge will be included.

The two Keystone claims at Richmond are being opened up by the Shafter people, who have a bond upon the property from the Elling estate.

The Red Bluff mine at Red Bluff is about to resume operations. C. B. Austin, manager of the company, has returned from Denver and states that the work of unwatering the shaft would begin immediately. The company has let the contract for a 100-ton concentrator. work upon the excavations and buildings to begin at once.

SILVER BOW COUNTY.

The Butte Copper Co. has been incorporated to work some claims in Saratoga canyon at Butte. It is said that the company has bonded and bought thirty-six claims in that section and will soon begin development work on them. C. Kleinschmidt of Butte has been made manager.

Several of the mines of the Anaconda, Parrott and Washoe groups of the Amalgamated Copper M. Co., recently tied up by the strike of the hoisting engineers, have resumed operations and ore is being hoisted. A full force of miners is engaged at the Parrott. At the Moonlight, Diamond and Green Mountain mines hoisting of ore has commenced.

NEVADA.

ELKO COUNTY.

The Eclipse G. M. Co. of Ogden, Utah, has been incorporated; capital, $200,000. The officers are J. F. Snedaker president and J. J. Driver secretary and treasurer. The company owns the Eclipse claim at Tuscarora.

The Dexter-Tuscarora output from its mine at Tuscarora for March was $6000. The cyanide product was only $1100, the mill having been shut down two weeks.

W. D. Higginbotham, manager of the White Rock Placer Co., expects to clean up $50,000 at least as the result of this season's run. The property covers the entire length of Barette canyon, about 65 miles northeast of Tuscarora.

LINCOLN COUNTY.

At the DeLamar Co.'s works, near DeLamar, the 500 H. P. engine is being taken up and with the boilers removed to Meadow Valley wash, alongside of the railroad, where they will be erected for the generating of electricity for transmission to the reduction works. Old machinery is being cleared away and preparations made for the erection of five Chilean mills upon their arrival.

NYE COUNTY.

A contract has been let by C. Peters to Clark & Brighton for the sinking of a 50-foot shaft on the Triangle fraction adjoining the Mizpah at Tonopah. Besides Peters the parties interested in the Triangle are Mrs. J. L. Butler and S. Bamberger of Salt Lake City, Utah.

The Southern Klondike mines, 9 miles south of Tonopah, are producing. About $26,000 worth of ore has been shipped from one of the mines owned by Bell & Court. One iron ledge, on which a shaft has been sunk about 25 feet, shows galena and iron that carries $20 in gold, besides silver and lead values. The main quartz ledge, owned by Bell & Court, is over 1 mile in length and from 4 to 14 feet wide. About 1 mile from Southern Klondike is Eastern Klondike, one ledge being worked by Sharp & Moore having produced ore that went over 700 ounces in silver per ton.

The Gold Hill Co. at Tonopah has made connection with the east shaft, and preparations are being made to sink the main working shaft to a depth of 500 feet. Hoisting works of sufficient capacity will be placed on the property.——The contract on the G. & H. tunnel has been completed, but the drift will be pushed on through the mountain. It is the intention of the owners to commence at once the sinking of a 500-foot shaft on the Silver State claim located in the tunnel.——The Halifax properties, located east Mount Oddie, are having a deep of shaft put down through strongly mineralized porphyry. No crosscutting will be done until the depth of 300 feet is reached. ——The Tonopah Con. Co. owns the McNamara claim, on which it is doing extensive work preparatory to extensive mining. The shaft, down 140 feet, is a double-compartment one, timbered from the surface. A steam hoist to supplant the present whim is one of the immediate improvements contemplated.

WASHOE COUNTY.

C. B. Bell, R. J. Sanders and S. H. Wheeler, who lately bought the Bony & Miller claim in Spanish Springs valley, near Reno, have taken out nine tons of ore which sold in Reno for $630. In addition to gold and silver, the ore carried 26.89% copper.

J. K. Miller of Colorado Springs, Colo., and associates have bought a group of claims in the Peavine district, near Reno. A vein 3 feet in width, showing values in gold and silver of from $27 to $80 per ton, has been opened up. They have also a copper property in the same district.

WHITE PINE COUNTY.

E. W. Tremont of Eureka says of the Pilot Knob copper claims, about 12 miles from Ely, that a large force of miners had been employed during the winter and the mines had been equipped with machinery and appliances for systematic prospecting.

NEW MEXICO.

BERNALILLO COUNTY.

A new gold camp is located in the Sandia mountain range, about 25 miles east of Albuquerque, where placer diggings have been operated for over a century. A month ago a representative of the Treasure Hill M. Co., operating at Kingman, Arizona, and composed of Colorado and Eastern people, bonded a group of claims for his company on a reef of rocks which he thought to be the source of the placer gold. Since then ore has been found in one of the claims averaging over $80 per ton. E. C. Gard of Denver is secretary of the company and is superintending work on the properties.

GRANT COUNTY.

Hamilton, Sanders & Jackson, owners of the Owl mine, at Gold gulch, near Central, recently made a very rich strike of gold ore. Shipments made netted $55 gold a ton. The mine is in a shale formation on the site of old Spanish diggings.

A railroad company is being organized in Lordsburg to build a 20-inch gauge road from the city to the mines south, connecting them with the railroad depot, the smelter and the concentrator. By its use a great saving will be made in the transportation of ores, and at the same time a good profit to its owners. It is not intended to make the road for passenger traffic. Most of the money for the building of the road will be subscribed by Lordsburg people, although considerable foreign capital will be interested. The surveys show that nearly every mine in the district can be reached with comparatively little trouble, and the pull will be a down hill one all the way.

LINCOLN COUNTY.

The Tellefore M. Co., at Red Cloud, is doing extensive development work and expects to ship ore in May. The Tellefore mine was worked fifty years ago and the ore packed to Santa Fe on burros.

The American G. M. Co. has consolidated its four groups of mines in the Nogal district and taken a bond on the Grover Cleveland and Champion. The company is capitalized at $5,000,000, with office at Chicago, Ill. Fully 6000 feet of development work has been done on the claims and all the mines show free milling ore. Heretofore only a 10-stamp mill has been used in treating the ore. The new owners will at once install a 30-stamp mill and add a cyanide plant. The officers are: President, A. T. Anderson of Hersher, Ill.; secretary, B. V. Phelps, Chicago, Ill.; general manager, J. M. Rice, and Supt., M. D. Gaylord, both of Nogal.

TAOS COUNTY.

A. G. Muller of Taos has made a rich strike near Cieneguilla. The vein is 28 feet wide and averages high in gold.

OREGON.

BAKER COUNTY.

M. C. Kestor, manager of the Buckeye mine, near Baker City, states that experiments have proved that the ore can be treated successfully. A roasting and leaching plant, capable of treating 100 tons of ore per day, will be erected this season. The company is installing machinery and making permanent improvements.

GRANT COUNTY.

The Monumental mine at Granite has resumed operations under the management of Colorado men. A large sinking plant is to be installed on the mine this season.

JOSEPHINE COUNTY.

J. E. Conner, owner of the Red Dog hydraulic placer mine on Briggs creek, near Grants Pass, has got his mine again in operation after repairing damages caused by a slide which carried away a large portion of the long flume.

The Golden Drift M. Co. has surveyed for its proposed ditch, which as projected will cover most of the valley adjacent to Grants Pass.

UNION COUNTY.

J. T. Miller of Chicago, president of the Eureka G. & C. M. & S. Co., recently organized with capital of $2,000,000 to work the ore of the Imnaha copper mines of Snake river, says he is satisfied there is ore enough in sight in the Imnaha mines to keep several smelters in operation, but that so long as transportation facilities are not provided smelters cannot be constructed or operated there. He states that the Eureka Co. would put in a 100-ton smelter by October 1 if a suitable boat was put on upper Snake river.

SOUTH DAKOTA.

LAWRENCE COUNTY.

W. H. Burrage of Boston, Mass., and associates have taken a bond on something over 1000 acres of Ragged Top territory at Lead, taking in the Spearfish and Deadwood-Standard Companies, the Potsdam group of claims and other nearby property. They are prospecting on a gigantic scale, employing 200 men, under the direction of Thomas Goodman, and it is stated that another hundred men are to be put on. The prospecting under way consists of opening a series of cuts, test pits, shallow shafts and other openings through the few feet of loose earth and rock found at the surface in the region. The purchasers are to pay something like $1,500,000 for the ground bonded, and their bond is to run for ninety days. If the transaction goes through the purchasers will organize a company and expect to erect one of the largest cyanide plants in the United States at some point on the ground.

The Mayham syndicate has bought the Columbus mine at Lead, with other groups adjoining on the north, making a total of about 300 acres, covering 6,500 feet along the strike of the mother vein of the country. The Columbus lode has been operated for many years by Ruth & Lardner with a 10-stamp mill. Mr. Ruth says the Columbus has produced $300,000 from free-milling ore.

The Black Hill Copper Co. is setting up a Chilean mill on the Benedict mining ground at Hornblende. A hoisting plant has been installed.

UTAH.

EMORY COUNTY.

The Kaiser M. Co. has been incorporated at Salt Lake City to operate the Copper Boy group of four claims near Summerville. The officers are J. A. Grose president and C. B. Jack secretary and treasurer.

JUAB COUNTY.

The Boston-Yankee Con. M. Co. has been incorporated at Augusta, Me., capital $1,000,000, by P. A. H. Franklin, Salt Lake City; E. C. Ramsdell, Boston, Mass.; H. T. Cram, A. J. Desmond and T. T. Haight, Portland, Me.

The Laclede M. Co., with properties near Diamond, has been incorporated. The company owns a group of ten claims, upon which a considerable amount of development work has been done by the owners of the stock of the new company. T. Weir is the manager and local representative and his associates are mostly St. Louis, Mo., people. The shaft is now down 328 feet and 600 feet of other development has been done on the 300-foot level. The plant now consists of an Ingersoll compressor, a hoist and an 80 H. P. boiler, which will be increased by two more boilers of the same capacity and a station pump. The shaft will be sunk to the 600-foot level.

N. Dunyon, Supt. Scranton in North Tintic, reports the mine in good condition, with shipments of first-class ore more than meeting operating expenses, while a lower grade, containing about 50% lead, has accumulated from development work to the amount of 1000 tons. About 125 tons of first class galena ore is shipped every month to Pennsylvania, the management being able to pay freight to that distant point and get a better net price than the smelter trust, operating here, is willing to pay. Unless better prices prevail, the Scranton will put in a concentrating plant. The ore shoot in which operations are being conducted measures in places 100 feet between walls.

PIUTE COUNTY.

The Mount Belknap M. & M. Co. has been incorporated, with office at Elsinore;

capital, $50,000. The officers are J. S. Hyde president and C. Hyldehl secretary. The company owns the Chief, Wolf, Black Hawk, Moon Shine, Reuben, Full Moon, Blue Bird and Half Moon, in the Mount Baldy district.

IRON COUNTY.

At the Johnny mine, at Stateline, twenty-two men are developing the property and blocking out ore, of which it is estimated there is now a value of about $35,000 on the dump. The work along the vein shows 104 feet of high-grade milling ore. A pump has been installed, a tank erected and 40,000 gallons of water are being taken from the mine daily, part of it being pumped to the Ophir mill, three-quarters of a mile away. About June 1st the Johnny will begin the construction of a 20-stamp mill, with machinery of a capacity to operate a 40-stamp mill. The Ophir mill, at Stateline, has been started up. Sixty men are employed in mine and mill and 300 tons of ore were handled during the first four days. The ore is reduced by roasting and leaching. The Margaret, which is situated between the Johnny and the Ophir at Stateline, has let a contract for continuing its double-compartment shaft, which is now down 100 feet on the 200-foot level, and is opening up milling ore in the old workings.

The Rice group of eight claims at Stateline has been bonded by Salt Lake people.

SANPETE COUNTY.

The discovery of a mountain of rock salt has been made near Gunnison and a large plant will be installed for refining. A number of Gunnison business men, including H. A. Kearns, Dr. A. F. Andrew, H. Robins and E. H. Clark, have been prospecting and at a comparatively slight depth came upon an immense deposit of the finest kind of rock salt. They have drilled in a number of places until they have several thousand tons of the salt in sight. Some of the rock shows by analysis about 98.88% of sodium chloride, with impurities consisting chiefly of iron oxide, which gives the crude mineral a reddish tinge. In boring for the salt several wells of salt water were found, the brine being of about 25% density. A small plant has been started and is making about two tons a day of table and dairy salt. The salt manufactured at Gunnison has a purity of about 99.76%, and the product so far has found a ready sale at the mine. The managers of the plant are preparing to install a boiling plant of a capacity of ten or fifteen tons a day, together with a crusher for reducing the rock salt. They assert that they can make and sell the product at a good profit at the prevailing prices. A test shipment of 300 tons will be made to San Francisco in a few weeks. It is expected a company will be incorporated under the name of the Gunnison Salt Co.

SALT LAKE COUNTY.

The lower terminal building of the United States Co.'s aerial tramway at Bingham has been started under construction. The tramway will be about 3 miles in length and have a carrying capacity of 1000 tons of ore daily.

SUMMIT COUNTY.

The Daly-Judge M. Co., paying $800,000, has bought the entire property of the Anchor M. Co. and contiguous holdings from Mrs. Mary Judge. By this the Daly-Judge Co. becomes the owner of a solid body of over 1200 acres of patented mineral land at Park City. These holdings now include the territories that have from time to time been held by the Utah M. Co., the White Pine G. & S. M. Co., the Jones Bonanza M. Co., the Anchor M. Co., several fractional claims belonging to Mrs. Judge and the Daly-Judge Co.

TOOELE COUNTY.

The management of the Golden Star Co., operating at Gold mountain, near the Annie Laurie mine, is preparing for the erection of a mill. A large amount of ore has been blocked out, and a combination stamp and cyanide mill with a capacity of from 50 to 100 tons daily is to be employed in reducing the ore.

WASHINGTON.

FERRY COUNTY.

R. H. Clarke of Spokane says the company owning the Meteor mine, at Meteor, is planning a tunnel 1000 feet long to reach the vein at a point 400 feet deep under the main shaft.

The Alamo G. M. & M. Co. at Meteor is sinking a shaft on the Red Dog claim. The ledge is 7 feet wide and has an 18-inch pay streak showing argentite.

LINCOLN COUNTY.

The White Rose M. Co. has been organized at Davenport, with C. H. Neal president, L. D. Todd secretary, J. C. Bowen manager and G. T. Eves Supt. The company owns seven claims in the Meteor mining district and will begin development immediately.

SNOHOMISH COUNTY.

Gold has been found in Index in paying quantities by F. Collins and R. Martins, who were digging an entrance to a cellar and struck the pay at a depth of about 3 feet. Other discoveries have been made. None have been developed.

It is reported that a large vein of $100 a ton gold ore has been struck in the Bonanza Queen group at Silverton. The new prospect exposed 8 feet of high-grade ore and 14 feet of concentrating ore at a depth of 60 feet.

WYOMING.

LARAMIE COUNTY.

The new Rambler mine on Douglas creek is to have a smelter. J. T. Holliday of the board of directors has completed arrangements for the erection of a copper matte plant of about forty tons daily capacity to begin with.

The King Solomon mine, 6 miles from Tie Siding, has been sold to I. Conkling and associates of Denver, Colo., who will install a plant of machinery and develop what is believed to be a rich vein of copper in the shaft.

FOREIGN.

BRITISH COLUMBIA.

(Special Correspondence).—The Mines Exchange, Ltd., of Nelson says conflicting stories concerning the new placer diggings on Horse Fly creek, Cariboo district, are being told by returning prospectors, but nothing can be known as to the extent and value of the field until after the snow has left the ground. A large number of prospectors are going in, traveling by the Horse Fly lake route. Later, when the snow is gone, it is thought that the river trail will be the preferable route. The new diggings are 190 miles by stage and 60 miles by trail from Ashcroft, on the railroad.

The Silver Cup mine at Lardeau, owned by the Horn - Pane people, has been bought by W. B. Pool and J. J. Young for, it is reported, $500,000. There is now 800 tons of silver-lead ore mined and ready for shipment, valued at $116,000, the product of the mine since November, 1901.

The Triune mine has been bonded by C. W. McCrossan, manager of the Lardeau S. & R. Co. If the smelting of the Triune ore is satisfactory the smelter will be enlarged to treat the ores from other Lardeau properties.

H. Z. Brock, manager of the Northwestern Development Syndicate, is procuring an electric 60 H. P. plant to be installed on the Camborne group at Lardeau. It is intended to put in three electric power drills.

The Turnover and Runover claims, located in Bayonne Camp, owned by H. L. Jackson of Ymir, have been bonded by C. P. Hill for $50,000. These claims adjoin the Bayonne group, bonded last fall by Finch & Campbell of Spokane for $100,000.

The annual report of the Crow's Nest Pass Coal Co. says that the net profits for 1901, after paying all operating expenses and all charges of every kind, amounted to $270,848.39. After paying dividends at the rate of 10% per annum the balance of $28,142.89 was carried forward to the credit of profit and loss. Thirteen hundred and twelve men were employed during the year, and 636 coke ovens have been constructed, with a capacity of 1000 tons of coke per day. Of the sum of $2,265,548.06 expended by the company during the year, $911,407.15 were paid out in wages and $346,092.41 for freight. The operations for the coming year will be on a much larger scale than that of the past year.

A strike of 2½ feet of high-grade ore at a vertical depth of 800 feet has been made in the Hewitt mine, near Silverton. The vein was cut at a point 1000 feet from the portal of the tunnel.

Nelson, March 20.

The Mines Exchange, Ltd., of Nelson says: The Burlington M. & M. Co. has been incorporated at Spokane, Wash., capital $150,000, by W. D. Wrighter, W. S. Rogers, C. W. Geih and J. H. Travers of Spokane and T. A. Noble of Pittsburg, Pa. This company owns a property in the Iron Horse group of claims situated in the dry ore belt of the Slocan. The property is equipped with a hoisting plant and connected with the railroad by a wagon road. It is claimed that there is a good shoot of ore in the Enterprise vein. There is considerable excitement in the town of Kaslo over the reported discovery of gold placer ground on Cooper creek some 4 miles from town. A company has been organized to work the deposit by the hydraulic method. At an annual meeting of the Simcoe M. Co., at Ymir, S. D. Brisay was re-elected president and treasurer. The company owns the Big Horn group of claims about 7 miles from Ymir, on which considerable development work has been done. It was decided at the meeting to resume operations. The management of the Estella mine in East Kootenay have bought the Thunder Hill concentrating plant which they are re-erecting at the Estella mine. The capacity of the plant is in the neighborhood of 100 tons per twenty-four hours. The Estella consists of a group of eight claims, with 2000 feet of development work done, exposing ores carrying grey copper, copper oxide, galena and pyrite, gold and silver.

Nelson, April 5.

It is reported that work will be started up on the Lightning Creek G. Gravels & Drainage Co.'s properties on Lightning creek, $30,000 having been provided for it. The shaft is down to a depth of 120 feet to bedrock and a drift out 150 feet. It is expected to open the old channel in a few feet more advance.

A strike is stated to have been made on the Leonora mine, at Mount Sicker, the rich vein already uncovered being encountered at a depth of 320 feet, in No. 3 tunnel. The ledge is about 30 feet wide, with a narrow vein of very high-grade ore. The trestle over the E. & N. Railway is finished, and track-laying on the Mount Sicker line commenced.

Fifteen men are employed driving a tunnel below the old works at the Hardie Mountain cinnabar mines. The mines are the property of the Hardie Cinnabar Mines, Ltd., of London, capital £50,000. The headquarters of the company are at Kamloops.

Two samples of ore from Princeton, one from the Olympia claim, owned by McRae Bros., and the other from Diamond B., owned by J. Beaver, have been found to contain platinum in commercial quantities. For several years past platinum has been recovered from placer workings in the Similkameen and Tulameen rivers, and considerable quantities have been found associated with the gold in Granite creek. A number of attempts made to locate the source of these placer deposits have finally resulted in success.

The Marie-Marilia M. Co. of B. C. has been incorporated in Minneapolis, Minn., to operate the Pedro group of claims on Canyon creek, Lardeau-Duncan division of West Kootenay. J. M. Miller of Rossland is a director.

The Luke Creek Gold-Copper M. Co. has been incorporated in Minneapolis, Minn., to operate two claims in the Fort Steele mining division.

A 3½-mile aerial tramway is under consideration for the True Blue mine at Kaslo. The plan is announced in connection with work on a new tunnel to tap the ore body at several hundred feet greater depth. If the showing at that point is satisfactory the tramway will be put through.

At the Granby smelter at Grand Forks four furnaces were in operation on the 2nd inst., increasing the capacity to 1500 tons daily.

A strike is reported made on the Monitor mine at New Denver. The pay streak in the drift shows 3 feet of solid ore of a high grade.

It is reported that the option given by the owners of the Anderson Lake mines on McGillivray creek at Lillooet to A. Hawks of Snohomish, Wash., will be taken up and the immediate development of the properties started on a large scale. The mill will, it is reported, be at once increased to twenty stamps.

It is reported that J. J. Hill and associates have bought a large interest in the Granby smelter at Grand Forks.

CANADA.

A summary of the mineral production of Canada for the year 1901, prepared by the geological department, shows the total mineral production for the year was $69,407,031, as compared with $64,488,037 in the year previous, or a total increase of $4,918,994. The entire gold production is valued at $24,462,222, of which the Yukon gold fields contributed $18,000,000. Of copper there was $6,600.104; pig iron, from Canadian ore, $1,121,113; lead, $2,199,784; nickel, $4,594,523; silver, $2,993,668, and iron exports, $762,284. These, with the gold production, makes a total of $42,824,698 metallic production. There was $26,282,333 non-metallic and $300,000 products not returned, which, added to the non-metallic makes, made a total production of $60,407,031. Coal production is valued at $14,671,122; coke, $1,264,360; petroleum, $953,415; asbestos, $1,186,434, and building material, $4,820,000.

MEXICO.

The Mexican Anthracite M. Co., C. P. Eagan president, is pushing development work at San Marcial. The shaft, now down about 240 feet, is expected to reach the big bodies of coal at 430 feet. A hoist and a 22-drill air compressor are in operation. The survey for the railroad between San Marcial and the Sonora Railway near Moreno is progressing under F. R. Brown, the chief engineer, who has twenty-three men engaged in the work. As soon as the survey is completed construction work will begin.

J. F. Delgado, owner of the Palagonite mine, near Escondido, Lower California, is projecting a large plant for the manufacture of mineral paint from the products of the mine. A small plant testing the material has made a satisfactory paint. Palagonite is a soft fine-grained stone easily worked.

San Francisco people are negotiating to buy the Ibarra mines, near Calmalli, in Lower California. They are a large group and many thousand dollars have been expended in their development. The price is $350,000.

Utah Strike M. Co. of Mantl, Utah, capital $50,000, has been incorporated, with T. E. Christenson president and E. T. Parry secretary and treasurer. The company owns the Utah Strike claim in the Cusihuirachic district of Chihuahua.

SIBERIA.

Exclusive mining privileges in the Eastern Siberia peninsula, it is claimed, have been granted by the Russian Government to J. Rosene of San Francisco and Col. Wonlarsky, retired, of the Russian Imperial Guard. The boundaries of the tract are as follows: East, Behring sea; south, Behring sea; north, Arctic ocean; west, line from Anadir bay through the River Angouirma to the Arctic. The area is as big as Washington, Oregon and California combined. The exploration and development will begin as soon as possible. Trading stations will be established at St. Lawrence bay, Plover bay and Anadir. The concession admits machinery, provisions and all the supplies of the company for twenty-five years free of duty. The policy in purchasing will be to buy from Russian concerns as much as possible, but the United States will be drawn upon heavily for machinery and supplies. The Northeast Siberian Company, incorporated in St. Petersburg with Rosene as manager, will develop the concession.

SOUTH AFRICA.

At Johannesburg to the 7th ult., twenty-six mines, each running fifty stamps, had been restarted. The native labor association has undertaken sufficient supply of natives from the east coast. They are reported coming in at the rate of 1000 per week.

THE PHILIPPINES.

H. Bernhardt, who for over a year has been engaged by the U. S. Coast and Geodetic Survey in the Philippine Islands, has returned to San Francisco. He says: "I saw at Leyte, in the Island of Samar, a ledge of gold quartz running down to the water's edge and extending many miles into the interior. The country is well wooded. In Mindanao island we found veins of coal."

Commercial Paragraphs.

THE Santa Fe Railway Co. will build new shops at San Bernardino, Cal., costing $107,855.

THE Sullivan Machinery Co. has established a branch office at 306 St. Louis St., El Paso, Texas.

THE Scott Supply & Tool Co., Denver, Colo., have moved into larger quarters at 1725-7 Blake St., that city.

THE Philadelphia office, at 612 Arch St., of the Stilwell-Bierce & Smith-Valle Co., of Dayton, Ohio, is now in charge of O. G. Smith.

SCHAW, BATCHER & CO., of Sacramento, Cal., have the contract for building works for a $200,000 water company organized at Keswick, Cal.

THE Western Chemical Mfg. Co. of Denver, Colo., is a reorganization of the Western Chemical Co., with increased capital and business resources.

H. D. & H. W. MORRIS, representatives of Chrome Steel Works, have removed their office from 194 Crocker Bldg. to 26 Montgomery St., San Francisco, Cal.

THE old established assaying office of L. Falkenau, 538 Sacramento St., San Francisco, Cal., is now in charge of the Falkenau Assaying Co. (incorporated), Louis Falkenau president.

JOHN W. STANFORD, of Calivo, Philippine Islands, wants catalogues of saw mill, wood working, mining and brick making machinery. He says there will also be a good market in the Philippines for turbine wheels and electric apparatus.

WILLIAM B. SCAIFE & SONS' mill, Oakmont, Penn., is enlarged and several new departments added. A new department is contemplated for the manufacture of the Kendel car trucks. A large contract for the Mexican Government has just been completed.

THE new rock drill invented by A. C. Bates of San Francisco, Cal., has been tested and is now placed on the market by Griffitts & Howlett, manufacturers of

mining machinery, 85 Fremont St., San Francisco. Those who have seen the drill in operation ascribe to it many points of excellence.

THE Chicago Pneumatic Tool Co. has absorbed the Standard Pneumatic Tool Co. and New York & Franklin Air Compressor Works, and are now sole manufacturers of the Boyer hammers, Little Giant drills and reversible boring machines, also compressors. Eccles & Smith, 91 Fremont St., are sole Pacific coast agents.

THE Standard Oil Co. is putting in a 276-mile 8-inch pipe line from Bakersfield to Point Richmond, Cal. The route follows the line of the Santa Fe road to Kernell, thence to Corcoran, thence to Lethent on the S. P. From there it runs straight to Mendota, thence following the railway line to the Point Richmond refinery. Pumping stations will be built every 25 miles.

PRESIDENT L. D. WOODFORD of the Tom Thumb G. M. & M. Co., Spokane, Wash., writes: "Three new Leyner drills of the latest work and improvement were shipped from Denver, Colo., to replace our three old drills, upon which radical improvements have been made. This was done at a cost of $275. Both of these purchases were made upon the recommendation of the superintendent, who reports that each will save its original cost in the present shaft work alone."

Personal.

FREDERICK BAKER, of London, is in Denver Colo.

A. P. CHITTENDEN is Supt. Pioneer G. M. Co., Towle, Cal.

V. M. CLEMENT of Salt Lake City, Utah, is in New York.

T. K. WILKINSON, of San Francisco, Cal., is at Gardnerville, Nev.

MANAGER HENLEY is now operating the Victor mine at Elkton, Colo.

GEORGE C. CARSON, late of Redding, Cal., is now in Birmingham, Ala.

J. F. WARNER has been appointed assistant State engineer of Wyoming.

A. J. UNDERWOOD is consulting engineer La Reine mine, Tintic, Utah.

U. G. WOLFE is manager of the Polaris M. Co. gold mine near Clifton, Ariz.

VICTOR M. BRASCHI of the City of Mexico, Mexico, is in San Francisco, Cal.

HARRY K. WHEELER, M. E., of Los Angeles, has returned from San Francisco.

R. A. CAMPBELL of the Miocene G. M. Co., at Harpers, B. C., is in Rossland, B. C.

THOMAS GOODMAN is in charge of extended prospecting work at Spearfish, S. D.

W. H. ELWOOD of Idaho Springs, Colo., is now Supt. Old Galena mines, Washoe, Nev.

M. L. BOWEN, manager Yo Tamhien mine, near Globe, Ariz., has gone to New York.

ROY D. HUNTER, Denver manager Sullivan Machinery Co., has returned from Chicago.

ALEXANDER REID has gone to China as chief mining engineer for the Pekin Syndicate.

SAM BECK of Prescott, Ariz., has been appointed Supt. Burson mine, near Wickenburg, Ariz.

OTTO VON GELDERN of San Francisco is planning a $70,000 irrigation system for Modesto, Cal.

W. S. JONES, M. E., of New York, is in the Cooks Inlet country of Alaska examining mines.

B. T. LEWIS, of Los Angeles, Cal., is examining mines in the Searchlight district of Nevada.

H. NILES, manager Ft. Bayard M. & M. Co., Silver City, N. M., has returned from New York.

LEWIS T. WRIGHT, manager of the Mountain Copper Co. at Keswick, Cal., is in San Francisco.

P. J. NEVINS, of New York, is manager of the French Gulch placer mine at Breckenridge, Colo.

D. J. SAYER, manager Butterfly-Terrible mine, near Ophir, Colo., has returned thence from Denver.

C. E. TOLMAN is now superintendent Con. G. M. Co. of Arizona, in the Guijas district, near Arivaca.

HOWARD DAVIS, superintendent of the Mammoth Bar River mine at Auburn, Cal., is in San Francisco.

J. EDDY of San Francisco has been appointed superintendent of the Gold Tunnel mine at Nevada City.

FRANK H. PROBERT of Los Angeles, Cal., has gone to St. George, Utah, to examine a copper property.

J. C. STEELE, Supt. Golden Jubilee mine, near Carrville, Cal., has returned there from San Francisco.

K. SCHMIDT has been appointed master mechanic Greene Copper M. Co., at La Cananea, Sonora, Mexico.

JOHN STARK, Supt. of several mines operated by W. S. Stratton at Cripple Creek, Colo., has resigned.

A. NEBEKER has resigned as superintendent of Coconino Co. mine and reduction works near Kanab, Ariz.

LEON M. HALL, consulting engineer Grass Valley, Cal., Con. M. Co., has returned to San Francisco, Cal.

J. GALLAGHER of Tuttletown, Cal., has been appointed Supt. Juhilee M. Co., at the Hazel Dell mine, near Sonora.

A. F. STEVENS, superintendent of the Addle Con. M. & M. Co., of Silver City, Ida., has returned from New York.

CHARLES DAVIES has sailed for the Ashanti G. Corporation, West Africa, where he will be assistant manager.

HARRY A. LEE, commissioner of mines bureau, will have charge of Colorado's mining exhibit at the St. Louis Exposition.

C. D. RIDGEWAY, of Telluride, Colo., succeeds Jno. Madill as superintendent Cochran M. Co., Deadwood, South Dakota.

C. REDPATH has been appointed superintendent of the John A. Logan and American Eagle mine at Cripple Creek, Colo.

H. F. STEWART has been appointed Supt. San Joaquin M. Co., at Angels Camp, Cal., succeeding J. McClay, resigned.

FRANK L. SIZER, M. E., has returned to Butte, Mont., after two weeks absence examining one of the newer districts of Montana.

F. J. SIEBERT, manager Tonopah Co., at Tonopah, Nev., is in Philadelphis, Pa., to attend a stockholders' meeting of the company.

RICH. B. STANFORD, formerly of Goldfield, Colo., is operating the Von Tromp and other mines for the Estey Syndicate, at Columbia, Cal.

W. L. WATTS has returned to Los Angeles, Cal., from a two months' trip through the Colorado river region in southern Nevada.

MANAGER THOMAS HOATSON of the Calumet & Hecla and Supt. Brady of the Michigan are inspecting the Empire mine, Marysville, Mont.

DR. DAVID T. DAY has resigned as chief of Department of Mines and Metallurgy at the St. Louis Exposition and will he succeeded hy Dr. J. A. Holmes, State Geologist of North Carolina.

J. L. SHAFTNER of Cleveland, Ohio, president International Miners' Congress, is in San Francisco. He says he expects a big meeting of the members of the Association at Butte, Mont., next July.

J. MADILL has resigned as Supt. Cochran M. & M. Co. at Lead, S. D., to take up the management of his own properties in the same locality. C. D. Ridgeway, late of Telluride, Colo., succeeds him.

WILLIAM WATTS and a crew of fifteen carpenters, who have been constructing a gold dredger at Wheatland, Cal., have gone to Sonora, Mexico, to remain about four months, constructing dredgers.

E. SARLIN, a mining engineer of Helsingfors, Finland, has been making a tour of the mines in California, Colorado and Arizona, studying American mining methods and machinery. He states that there are extensive placers in northern Finland which are to he opened up soon.

KASAKU ASANO of Tokio, Japan, a representative of the Ashio Copper Co. of Japan, has been at Clifton, Ariz., investigating the methods of treating copper ores. He is in the United States for the purpose of gaining knowledge of American copper mining methods and machinery, with a view to making changes in his company's plant in Japan.

Recently Declared Mining Dividends.

	Payable.
Vindicator Con. G. M. Co., Colo., quarterly, 3 cents extra, 2 cents per share, $55,000	April 25
Portland G. M. Co., Colo., quarterly, 6 cents per share, $180,000.	April 15
Mary McKinney G. M. Co., Colorado, quarterly 3 cents per share, $30,000	April 10
Finance Con. M. Co., Colorado, ½ cent per share, $2000	April 10
Daly-West M. Co., Utah, monthly 40 cents per share, $72,000	April 10

Books Received.

"Locomotive Sparks," hy W. F. M. Cross, 8 vo., 172 pages, illustrated, is a study of the fuel losses from locomotives in the form of sparks. It is a compilation of data of observation and experiments useful to students of locomotive performance and designers of spark arresting and fuel saving devices for locomotives. Published hy John Wiley & Sons, 43 East Nineteenth St., New York. Price $2.

Latest Market Reports.

SAN FRANCISCO, April 11, 1902.

METALS.

SILVER.—Per oz., Troy: London, 24¾d (standard ounce, 925 fine); New York, har silver. 53¾c, refined (1000 fine); San Francisco, 53¾c; Mexican dollars, 44½c San Francisco, 43c New York.

COPPER.—New York: Lake, 1 to 3 casks, $12.25; carload lots, $12.00; Electrolytic, 1 to 3 casks, $12.00; carload lots, $12.25; Casting, 1 to 3 casks, $12.00; carload lots, $12.25. San Francisco: $14.00. Mill copper plates, $17.00; hars, 18@24c. London: £53 7s 8d per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lhs.; pipe 5½, sheet 6, har 5½c; pig, $4.75. London, £11 8s 9d per ton.

SPELTER. — New York, $4.35; St. Louis, $4.00; London, £17 16s 3d per ton; San Francisco, ton lots, 5½c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lh. lots, 10c; 300 to 500 lbs., 11c; 100-lh. lots, 13@15c.

TIN. — New York, pig, $27.00; San Francisco, ton lots, 27c; 1000 lbs., 27⅛c; 500 lbs., 27¼c; 200 lbs., 27½c; less, 28c; bar tin, ℔ lb, 30c.

PLATINUM.—San Francisco, crude, $17 ℔ oz.; New York, $18 per Troy oz

QUICKSILVER. — New York, $51.00 large lots; London, £8 15s; San Francisco, iocal, $47.50 ℔ flask of 76½ lbs.; Denver, $51.00. Export, $45.00.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots. 18c; San Francisco, Plumbers', 100-lb. lots, 14.20c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $17.25; gray forge, $17.75; San Francisco, har, 2.75 ℔ lb.,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $31.75; open hearth billets, $32.25; San Francisco, bar, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per hbl.

LIME.—Santa Cruz, $1.60; Rocbe Harbor, $1.60 per hbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19 50; extra sizes higher; redwood, $19.00@20.00; latb, 4 feet, $3.90 @4.00; pickets, $19.00; sbingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymho, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11.75, long ton.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2¾@3c ℔ lb.; blue vitriol, 5¾@6¼c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2½@2¾c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in hbls, 8c; caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, boiled, hhl., 76c; cs., 81c; raw, hhl., 74c; cs., 79c; lots of 5 bhls., 1c less; Lucol oil, hoiled, hhl., 66c; cs, 71c; raw, hbl., 64c; cs, 69c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in hulk, 13½c; Mineral Seal, iron bbls, 19c; wooden bhls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 15½c; do., cs., 21½c; 86° Gasoline, hulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 20½c; Lard Oil, No. 1 bbl., 60c: cs., 65c; Neatsfoot Oil, bbl., 70c; cs.. 72½c; No. 1 hhl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¾c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb, 7¼c; less than 500 lbs., per lb., 7½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bhls., 1 ton and over, 6¾c; do. in kegs, 7¼c.

RED LEAD AND LITHARGE —One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c.

ASSAY LITHARGE.—Per lb., 9c.

BISMUTH.—Subnitrate, per lb., $1 60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c: calcined, 20c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2⅛ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb, $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

EMERGENCY SHACKLE.—No. 696,136. March 25, 1902. E F. Diamond, Oakland, Cal. The object of this invention is to provide a means for connecting cars so that they may continue their journey after the couplings have become broken or disabled. It consists of rectangular yokes with a single open side to fit over a portion of the drawhead, pins or rods extending through holes in said yokes and chains connecting the pins of one drawhead with those of the other, through which power may be applied to draw the cars.

QUICKSILVER SEPARATING AND CONTINUOUS ORE FURNACE. — No. 696,323. March 25, 1902. C. Fitzgerald, San Francisco, Cal. One-half assigned to W. B. Gester, Newcastle, Cal. This invention relates to improvements in furnaces for roasting ores, and particularly ores containing mercury. It consists of inclined muffles having spaces above and below, a partition within the lower space whereby the heat is directed to the front, thence passes around the partition and beneath another portion of the bottom to the rear; ore inlets and outlets and pipes embedded in the walls of the furnace having one end opening to the outer air and the other entering the muffles, and means by which heated air may be delivered thereto, and a vapor outlet, and means for condensing mercurial vapors.

BED BOTTOM ATTACHMENT.—No. 696,239. March 25, 1902. John Hoey, San Francisco, Cal. This invention relates to attachments for bed bottoms, using woven wire and similar mattresses. It consists in the combination with the wooden side bars of such a mattress or bed bottom having adjustable and reversible plate and lug, which is designed when in its normal use to retain the bed bottom frame in position upon a pedestal frame, and its other use is, when turned, to protect the ends of the side frames and prevent their being split and damaged during transportation.

REVOLVING CYLINDER EXPLOSIVE ENGINE.—No. 696,251. March 25, 1902. J. D. McFarland, Jr. San Francisco, Cal. One-half assigned to John Bruckman of same place. This invention relates to an engine having cylinders mounted radially with relation to an axis and suspended with a

MINING AND SCIENTIFIC PRESS.

Whole No. 2178.—VOLUME LXXXIV. Number 16. SAN FRANCISCO, CAL., SATURDAY, APRIL 19, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Pacific Coast Iron Manufacture.

The great hodies of hematite, magnetite and specular iron ore which have heen discovered in many of the islands of southeastern Alaska and along the coast of British Columhia during the last four years are ahout to he exploited on a considerahle scale for the manufacture of iron and steel. In 1899 far-seeing manufacturers of iron and steel in Pittsburg and other Eastern centers of the industry commenced making inquiries for availahle iron ore deposits on the Pacific coast. Their work, conducted quietly, is only now hecoming puhlic in the form of results well on the way toward final accomplishment.

According to accounts they have bought many specially desirahle deposits of ore close to tide water and are planning great coke plants and hlast furnaces.

This journal has repeatedly called attention to the dormant value of these Pacific coast iron ore deposits and a few months since presented an elahorate analysis of the actual commercial conditions, which made iron and steel manufacture on the Pacific coast a present commercial possibility for not only the local, hut for the world's markets as well, in competition with the already estahlished Pennsylvania and Ohio industry. The plans just hecoming puhlic confirm the correctness of the forecast this paper made.

The westward-facing shores of the Pacific have come to their own in the way of commercial transportation in the East. It is also notahle that capital does not have to lock itself up five months in the year in ore carrying ships and docks that cannot be used during that period on account of ice. That this is not a small matter is evidenced hy the ore carrying rates on the great lakes which this year are to he several cents less a ton hecause the earlier hreaking up of the ice is expected to permit of two trips in April where none are ordinarily counted on.

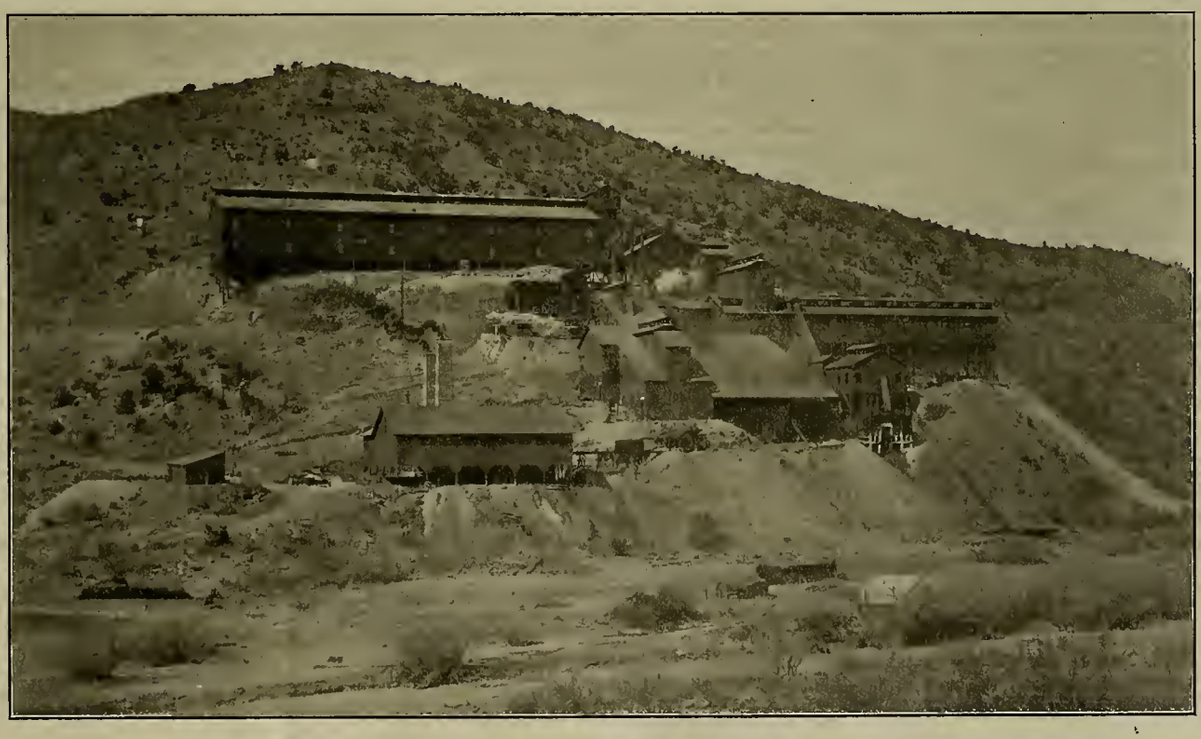
Opening a Platinum-Bearing Lode in Arendal, Norway.

The estahlishment of one great iron and steel plant is under consideration at San Francisco. The second to he projected, hut prohably the first to go into operation, is a 200-ton blast furnace to he located at Tacoma, Wash. The former expects to use California iron ores and will have to import coke. The Tacoma plant has its coke and limestone close at hand and will freight its ores hy water from the island districts to the northward. The plants that will follow these pioneers will in all prohahility he located at the iron mines on the islands of southeastern Alaska. The conditions are there the most favorahle for reducing the reducible item of transportation to its lowest limit. Prince of Wales Island to an exceptional degree offers natural facilities for iron manufacture and is commercially well located. The ship transportation of coke from, say Puget Sound, to the furnaces at the iron mines on Prince of Wales Island, and the return transportation thence of the finished iron and steel, will only require half the vessel tonnage to the ton of iron production that the transportation of the iron ore from Prince of Wales Island mines to Puget Sound would necessitate. This arises from the fact that the weight of coke required to produce a ton of iron is practically the weight of the waste in a ton of iron ore, and while the total weight transported is practically the same in either case, it makes in the first case an even load of ahout half each way, while in the last it is all in one load one way, which of necessity means douhle the ship tonnage for the same weight of iron produced.

This may not he a very great difference in cents per ton, hut it is the little differences in cents per ton that decide the competitive survival of great industries at the present time. The situation for profit in Pacific coast iron manufacture seems favorahly assured. It is gratifying to he ahle to record the initiation of the husiness of its estahlishment.

A Platinum-Bearing Lode.

The accompanying illustration is of the discovery of a lode hearing platinum, located at Arendal, Norway. The discovery was made in the summer of 1901, and developments so far made indicate a commercial quantity of the metal in the rock. An experimental treatment plant of ten tons daily capacity has been erected. The deposit is quite extensive. All of the men shown in the view are standing on the outcrop of the ore hody.



Black Warrior Copper Co., Amalgamated, Leaching Plant at Black Warrior, Ariz.—(See Page 218.)

conditions justifying large scale iron and steel manufacture. They have always had the iron ores for the seeking, closer even to tide waters than are the Michigan and Minnesota ore heds to the lakes. Cheap coke supplies promise to meet the demand now ahout to he made for them. The facilities for, and costs of assemhling the raw materials are at once superior and cheaper than in the East. Iron ore can he mined and transported through the entire twelve months of the year. Capital does not have to lock itself up for several months each year in stock ore piles—in fact it is possible to eliminate for some installations the stock ore pile entirely and dump the ore from the mine car directly into bins feeding hy gravity the hlast furnaces. There is the same fortunate situation for the limestone required as flux, and water transportation for coke as against rail

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THE electrical utilization of water powers can hardly result in a development of power supply in excess of a market consumption. If electrical power can properly he termed a commodity, it is so flexihle a commodity, and so interchangeahle into light and heat, that it will find new uses which will consume any production that is made. The only limit use will have will be found to be the commercial one of the cost of creating the supply.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

San Francisco, April 19, 1902.

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The Secretary's Decision in the Scripper Cases.

The Secretary of the Interior has rendered a decision in the cases of the Kern Oil Co. vs. Clarke, and the Gray Eagle Oil Co. vs. Clarke, involving petroleum bearing lands in the Bakersfield oil field of Kern county, Cal. The decision which has been announced upholds every point that was made in Commissioner Hermann's decision on the same cases a year since. While, as would appear from the telegraphed summary of the opinion, there are no new grounds for it advanced, it is stated that the discussion of the questions involved has been elaborated, and authorities have been compared and cited more fully. It may be taken that the decision just rendered indicates and finally settles the policy of the Interior Department in its definitive rulings as to the future classification of public lands. The Secretary's opinion is that the provision of the statute which declares that forest reserve lien selections can only be made on vacant land, refers to the physical condition of the land, and prevents the selection of lands which are occupied for mining or any other purpose, even though no entry of them has been made at the local land office.

This last declaration is of vast importance to the mining industry. It is common sense applied to the definition of common conditions in a mining district. Practically a reaffirmation of Commissioner Hermann's definition, it illustrates the value to a great industry of a mind familiar with its details in a place where decisions are made affecting the prosecution of the industry. It is notable that it is bringing the definition of what constitutes mineral lands back to what the framers of the statute meant, and is putting the Interior Department mineral land rulings in accord with many decisions of trial courts and with some decisions made by appeal courts.

Heretofore many rulings have been made which did not recognize the physical occupancy of the land for mining as evidence of its character and proper classification as mineral land. With this recognized, the classification of railroad grant lands in mineral-bearing districts becomes a much simpler matter, and, presuming good faith to the parties on both sides, the irritating friction that has existed for years should largely disappear. The effect of the ruling is to make a physical fact the conclusive evidence of the classification in place of the opinions of experts or inexperts as to whether mineral which cannot be seen will or will not pay commercially. Is the land in bona fide occupancy as mining claims? will be the main question. If it is, the land is mineral. If it is not, the land is non-mineral.

It is reported that the scrippers will now take their contention into the courts. Beaten in law, and by the facts and by public policy, they have still another trial simply because an executive department is not a court. In the face of the clear logical definition of the meaning of the statute that the Secretary of the Interior makes, it would seem unthinkable that the scrippers should obtain a reversal of the decision. The only possible contention that can be made is over the provision of the statute requiring physical discovery as a condition precedent to the right to validly locate a mining claim. To meet this it will be necessary for the claimants under mining locations to show to the courts beyond the question of a doubt the common physical relation of the minable values in placer deposits to the surface on which locations must be made. This common physical relation is that the valuable mineral is covered by some depth—sometimes considerable—of barren overburden which has to be removed or penetrated to make the physical discovery. Nature rarely does this removing or penetrating, but commonly provides traces or prospects to indicate to the miner what particular surface to choose, from which to explore downward. This common physical relation of the mineral in the placer to the surface is the common physical relation in the gold-bearing placers. Actual discoveries are only uncommonly made on the physical surface. If the scrippers should succeed in having the court rule that a physical discovery of mineral is the condition precedent to a valid placer location, the entire practice of fifty years in making placer locations is reversed, and the real intent of the statute relating to placer mining is practically nullified. The decision of the Interior Department that bona fide occupancy made by a placer mining location vests an exclusive conditional grant in the locator is the Interior Department's recognition, though a tardy one, of the actual physical condition that miners and the public have always recognized. Nowhere and at no time have miners as between themselves ever questioned placer locations made in good faith—even though no precedent discovery was made. That is, they do not ignore occupancy and proceed by making the actual discovery to initiate a superior title. The miners have always recognized occupancy in good faith as the basis of a location and exclusive possession under it. The statute was intended to recognize this common practice. The Interior Department by its decision here reviewed so declares it. Properly and fully presented, the courts can be depended on to make it their ruling.

What the Smelter Combination is Doing to Colorado.

Other interests in Colorado, besides that of the mine owner alone, are beginning to feel the effects of the policy of the smelter combination. It has needed something of the kind to make the communities solely supported by the mines realize their dependence on them. In the feeling inspired by the sense of a common injury there is a general enlightenment as to the cause. Compressed into a sentence, it can be said, that the policy of the smelter combination which begins by keeping empty the pocket of the hundreds of mine owners in Colorado, ends by keeping empty the stomachs of the thousands of people in the mining communities and wherever in the United States anything used for mining is produced.

This seems a strong sweeping statement, but it will stand the analysis of the most cold blooded investigation as to the facts. The policy of the smelter trust in Colorado is not simply a matter of private injury to a few mine owners, but is a public wrong striking at every material interest of the State.

The contemplation of the situation is not a correction of it. It is not worth while to discuss how the smelter combination does it. The why it does it is easily answered: Its policy pays them money at the present time. It is profit they are after and which they are getting. The important matter is: What is Colorado going to do about it? The question, as pointed out, is broader than the pockets of the mine owners. The latter have so far been left to act alone under every possible disadvantage that public indifference could put in the way. If the public will cease being indifferent, if it will grasp firmly and unyieldingly the idea that it must insure the possibility of profit to the mine operator if it would insure for itself a full stomach, it can by permanently joining the mine operators destroy the smelter combination in Colorado.

In commenting on the recent meeting of Colorado mine owners at Denver, this journal suggested that the miners—the men who work for wages paid from the product of mines—had a joint interest in destroying the smelter combination, and that they should join in doing it. The suggestion was tentative. Behind it was the idea that the other industrial and the trading interests should be allies against the one octopus-like interest. It appeared as though the statement of the idea then would complicate the consideration of the situation by those most interested. If so then, it is not now, and it appears that even part of the transportation interest is feeling the effect of the knock-out drops administered by the smelter combination. It may have been made sick enough to see the mistake it has made in community of interest. If it can be made to see that there is a greater permanent profit for it in a community of interest with the mine operators and people of Colorado than in a community of interest with the smelter combination, the finish of the latter is in sight.

The best remedy for the trouble with the Colorado mining industry is one created and applied by the industry itself. For any other a fee must be paid, and it can easily occur that the doctor's fee kills the patient after his other ailment is cured.

Congress could pass a law taking off the return of duties paid on lead-silver ores on the metal being re-exported. That would stop the importation of the ores from Chili, Mexico and British Columbia, which are used to flux the dry gold-bearing ores to the exclusion of our own production of sulphide ores. But this remedy being a political one could not possibly be applied before mining in Colorado was pretty well killed.

This journal has frequently indicated the lines on which protective action to be effective must be conducted. Mine operators must own and operate their own smelters and mills—not necessarily individual plants, not necessarily co-operative plants. The business organization of smelting and milling by the present interests controlling is a good model for imitation. The profit of smelting and milling as a distinct profit from the profit of mining must be eliminated. The furnace and mill must be machines kept in good service condition, but not fattened at the charge of the mine. Transportation must be made absolutely equal and fair in its charges, giving special advantage to no one interest over another. These things must be accomplished, otherwise metal mining will become in Colorado what coal mining and iron mining have become in other communities.

Some positive action should be taken by the Government at Washington to settle finally for all time the irritating Alaska boundary question. The modus vivendi is simply making a worse matter of a bad one. It is a concession of occupancy and practical sovereignty over land which we know to be our own and expect our title to be confirmed to. It is an attempt to do indirectly what the people of this country would not permit its Government to do directly. There is nothing surprising in the reports that old boundary monuments are being destroyed by the Canadian officials. Having provided them with the opportunity, they use it. Aside from all sentiment in the matter, the land the Canadians are seeking to bluff this country out of is valuable mineral land. This has reference not only to the Porcupine district west of Lynn canal, but the entire strip of mainland and islands south to the Portland canal. As exploration extends inland on the mainland strip, new discoveries of mines are being made, which, though in the prospect stage now, offer the promise of becoming valuable mines later on. The officials who have the matter in hand may be assuming that it is only a matter of a few years when the placers in Porcupine district will be worked out and the disputed territory become valueless. It is a mistake to assume this. There are lode deposits in the district; and with the working out of the placers, they will receive a development which is likely to make the population fixed for many years to come. In the end it will be realized that there has been nothing gained, but much lost by not settling the boundary question in the beginning.

Concentrates.

REFINING copper by electrolysis costs from ½ cent to ¾ cent per pound.

IT is best to plan the power plant of a stamp mill in a ratio not less than 2½ H. P. for each stamp head.

CAST IRON NAILS are preferable for use in flume building to steel wire nails. They should be burned before being used.

BATTERY AMALGAM almost invariably carries more gold than the amalgam taken off of the plates outside of the battery.

A LODE that enters a location across one side line and leaves the location across the same side line has no extralateral right.

USEFUL WORK in pumping to the extent of 45% of the original water power is good practice with a long-distance electric transmission.

THE chlorination process is not adapted to working sulphurets containing copper. The consumption of chemicals is too considerable.

THE carat unit of weight for gems is four grains. As used in describing gold, it refers to the number of parts of pure gold in twenty-four parts of alloy.

THE necessity for doing assessment work on a mining claim ceases with the issuing of the Receiver's certificate at the local land office showing that the patent has been paid for.

IN reducing the strength of an acid by water, the acid should be poured into the water, not the water into the acid, and the mixture should be stirred during the pouring.

BELLITE is a mixture of nitrate of ammonia and dinitro-benzol. It absorbs very little moisture after compression, hot, into cartridges. It is a powerful but safe explosive.

AGRICULTURAL LAND PATENTS in California issued between 1866 and 1872 contained a clause reserving the extralateral rights of lodes the apices of which were in adjoining land.

IN tempering rock drills, heat the edge and as little behind it as is practicable. Heating too far back develops a tendency to break off when the first few blows are struck on it in a hole.

BORT, the variety of diamond used in diamond drills, is all mined from alluvial deposits in the Province of Bahia, Brazil. The supply is decreasing while the consumption is increasing.

THERE is no market in California for tungsten ores. The Illinois Steel Co. at Chicago, Ill., or the Colorado Iron Works at Pueblo, Colo., use small quantities, and some is exported to Europe.

A CLAIM located on January 1st of 1902 does not require any expenditure for assessment work during 1902. A full $100 expenditure must be made in 1903 and no work done in 1902 will count towards it.

TO have a constant pressure for the feed water supply for stamp batteries and for hydraulic classifiers the preferable method is an overflowing tank. So long as some water overflows the pressure remains constant.

ROCK CLASSIFICATION is not a matter of exact definitions. The chemical and physical composition is infinitely varied. Geologists use the microscope to determine rocks. For practical mining use the eye will do very well.

THE strike of an ore vein is the general direction of a horizontal line in it. The dip of a vein is always the slope's angle measured between a line in the vein at right angles with the strike line and a horizontal plane through the strike line.

THE pay lead in the Transvaal gold mines is always narrow and sometimes very thin—6 inches to 2 feet is about the range. The uniformity of payable values over large areas is the condition that makes them so profitable for large-scale working.

TANGENTIAL WATER WHEELS are now in use operating under heads ranging from 8 feet to 1700 feet, and plans are being made for some projected power plants in California which will call for tangential water wheels operating under 2000 feet head.

A SMALL MILL on a mine is apt to make a higher showing of average ore value than a large mill on the same mine. The difference is in the grades of ore, not in the mills. It almost invariably happens that the small mill gets more closely picked ore.

THE forging of large masses of steel and iron by steam hammers is almost entirely abandoned now. In its place hydraulic pressure is employed. The hammer blows do not work the metal as uniformly as the hydraulic press, and the latter is found less costly of operation and maintenance.

A $3 A DAY MAN who works with the men may be able to superintend and direct the miners in a drift placer mine, but he is not because of this ability necessarily the cheapest manager for such a mine. A $10 a day man, who does not work with the men, is much more likely to prove the cheaper manager.

THE stamp milling practice in the Transvaal mills results in a 24-hour duty of about 4½ tons to the stamp. California stamp mill practice varies from as low as 1.6 ton duty to 5 tons duty to the stamp head. Transvaal mills crush ordinarily through a 30-mesh screen and California mills through a 40-mesh screen.

AT one stamp mill in California the final tailings are reported to assay from 12 cents to 20 cents to the ton, at another the final losses in the tailings are 50 cents a ton. The last seems large compared to the other, but it was found that it cost more per ton to reduce the loss than the added amount saved would pay.

THE use of cyanide for cleaning amalgamated silver plates is to be made sparingly. It has a tendency to harden the surface of the plate so that it will not catch and hold amalgam. Weak nitric acid solution, salt solution or lye are all preferable. A rubbing up with a paste made of wood ashes will sometimes prove efficient.

UNDER the Forest Reserve law, the Secretary of the Interior is authorized to grant permits to construct ditches and power plants; but he is not granting any pending a reforming of the law by Congress, two bills for which are now pending. It seems that under the law as it stands a permit granted could be revoked at any time.

IF the locator of a mining claim fails to do the annual assessment work for any year, the claim becomes forfeit and can be located by some one else; but the original locator can revive his claim by starting work on it before it is located by some one else. He must, however, complete by continuous work the $100 assessment to hold the claim.

THE fact that a school land section has been patented by the State and sold by it does not operate to prevent a valid mining location being made on a lode known at the time the State took its patent. The State has no right to mineral lands under the school land grant, and if patented to it by mistake the patent is void as to mineral lodes.

THE character of coal is not fixed by a chemical analysis. Anthracite and bituminous coal shade into each other through a great number of ratios of fixed carbon volatile matter and ash. Technically, a coal that contains no volatile carbon is anthracitic, but the percentage of ash may be so high as to class it with the bituminous coals.

PLATINUM, supposed only a few years since to be limited in occurrence to placers, is now known in rock in place. There is a chance of finding it in quantities sufficient to mine, and it is worth while to assay antimonial, arsenical and other copper ores, particularly gray copper or tetrahedrite, for platinum. Deposits of chromium should also be assayed for platinum.

IT is not customary to use quicksilver in the head boxes of a hydraulic mine sluice. In boxes part way down the line and in the undercurrents its use is common. Undercurrents have been put in some of the California streams where the tailings from hydraulic mines located several miles above would pass through them and a paying amount of gold and amalgam recovered.

THE provision of the statute requiring placer claims to conform to legal subdivisions of the public land survey is not followed strictly in making locations. That is, a placer location is not invalidated by reason of not conforming to the subdivision lines. The safest way is to locate and describe by monuments and boundaries so placed as to include the land believed to constitute the placer.

IT is desirable to separate platinum and placer gold by panning instead of melting them together into a bar and letting the refinery do the parting. These two metals can be parted by careful panning. The platinum can then be sold separately. The refineries buying bullion in the bar would not be likely to make any payment for the platinum, and if they should, would couple it with a refining charge.

PLACER GOLD when used in commercial transactions in mining camps usually passes current at a discount which allows a safe margin to the trader over the costs of transportation to the mint and refining. The gold which is current at $16 an ounce would be worth about $17 an ounce at the mint. Fine placer gold is, as a rule, purer than the coarse gold from the same localities and brings more per ounce.

WHILE a locator of a mining claim takes by the location any improvements made by former locators, those improvements can not be used as part of the $500 expenditure required for application for patent. A subsequent deed to the improvements, even if real consideration be given, does not give the right to so use them. The improvements were forfeit with the location, and no title remains which could be conveyed by deed.

THE day wages rate of miners' labor is not necessarily a measure of comparative cost of mine labor. Low wages almost invariably mean less efficient workmen. As these miners gain in efficiency it will be found that they demand and receive higher day wages. A careful analysis of mining labor costs in different countries will show that the lowest labor cost is associated with the higher, if not the highest, day wages rates.

THE most conservative accounts of Thunder Mountain, Idaho, describe it as a district of free milling gold ores occupying an area of from 5 to 8 miles square. The formation is eruptive, generally described as rhyolite, though some accounts state the presence of phonolite. The country rock carries the gold. It is generally low grade, with, it is stated, wide zones and bodies of $5 to $7 a ton rock and occasional narrow streaks of very high grade ore. The rock is soft as far as developed and there is an absence of pyrite. While the district is not exactly a poor man's district, it would seem to be an exceedingly promising one for poor men's mines, the kind of mines that can be operated without dependence on smelters, custom mills, or even railroads.

THE beds of streams which have been meandered by the United States land survey are public waters, but not unless so declared navigable waters. In neither case are they vacant public lands to which a notice of location of a placer claim could give an exclusive possession to the locator. The States have control of such beds, and they may provide laws for their acquisition for gold dredging, or they may permit mining customs and regulations to control their mining use.

THE costs of mine output should be estimated in units of ore, the raw material for the metal output rather than in the units of metal. Comparisons can be made much more intelligently between the costs per ton of ore output than between the costs per ton of metal produced. While different mine operators have different methods of charging development work costs, the preferable method would seem to be to charge it up to the current mine output, rather than to capital account.

THE waste incident to development through stock exchanges cannot be unreservedly termed an avoidable waste. Neither can the waste incident to a rush into a new district be considered an avoidable waste or one which on the whole it would be desirable to be without. Both agencies concentrate in short time periods the energy of large masses of capital into mines, and waste. Which are mines and what is waste are known the sooner as a result of this intensive energy of application. The ratio of the two would not likely be made much different if the same amount of capital were put into the business with deliberation through a long period of years.

THE effective capacity per hour of placer gold-saving tables is a variable for which no general rule or formula has been deduced. There is rarely in the practical use of such apparatus an identity of physical and commercial conditions. Each installation has its special peculiarities, and its capacity is determined by trial rather than by rule. In practice it is usual to adjust grade and width of the table to the kind and quantity of gold bearing material to be handled. Having adjusted grade and width to save the gold, the capacity of the particular table is measured directly by measuring the material that passes over it. In dredger practice, where the material is screened down very fine before going on the table, a rough working rule might be obtained from a sufficient number of carefully conducted and recorded tests.

THE quartz ledges of the Cœur d'Alene gold belt are divided into two distinct classes. The one on which the most work has been done are small veins running from a few inches up to 3 or 4 feet. The value is ordinarily from $6 to $8 per ton. There are frequently pockets found in all of them which will run as high as $2000, or even higher. These pockets are sometimes extensive, as much as $60,000 having been taken from a single pocket. Several others have approached those figures. If one of these veins is opened at a pocket it can be worked by poor men, as enough can be taken from the pocket to open up the claim and tide the owners over until another pocket is struck. If a pocket is not found at first the owner holds on, doing his annual assessment work, knowing that sooner or later he will strike one, and if it is one of considerable size he will be independent thereafter, though it is not likely that any mine will ever be found among ledges of this class that will become known throughout the mining world, although there will be a lot of them that will make comfortable fortunes for their owners, and a combination of several of them may become a really great mine. It is in these ledges that the success of the camp lies, as the conditions will always insure a divided ownership.

CLAIMS of gains of percentages of efficiency in processes and machines should always be investigated closely before acceptance. There is always the possibility of an error in the calculations, and frequently one of the elements that should be estimated is not in the promoter's showing. A machine or process may make a saving at one point that increases efficiency, but the gain involves a compensatory loss at another point which is overlooked. Commercial metallurgical processes cannot be made too refined. The profit difference between what is paid for the metal recovered and what it sells for is what counts. Better a loss of some of the metal than an increase of cost of all of it. This point is usually overlooked by the inventors of machines to save the last ultimate particle of fine gold in auriferous sands. Assuming that common methods and appliances would save 80% of it, the more refined appliances would be doing remarkably in commercial practice to save three-fourths of the remaining 20%. If it saved this additional quantity at no increase of average cost of recovery for the 80% it would be commercially desirable, but, and here is the point commonly overlooked, it is far more apt to so increase the cost of saving the 80% obtainable anyway, that there is no actual economy, but a loss. Capital locked up in machinery and in mining ground is an element of cost, just as much as is labor employed in mining. A rapid working out of a gold mine without recovering all the gold may be more profitable than a slow working recovering more of it, the operating costs being the same in both cases.

Some Experiments with Concentration.

Written for the MINING AND SCIENTIFIC PRESS by WM. H. WASHBURN.

Your recent article on "Doing and Telling" suggests the possible usefulness to some of your readers of "telling" about an experience of the writer in stamp mill work some time since. The ore was principally quartz, carrying very fine gold, associated with pyrites and nagyagite. This combination of tellurium, as well as others, is not considered easy to concentrate, being readily carried off as slimes. In view of this, the results obtained seem well worth consideration. The mill was of ten stamps of 1000 pounds each, with two concentrators of the table type, one being intended for each battery of five stamps, and the mill, which was new, was so started up. Careful experiment and repeated assays, however, proved that one concentrator made a closer saving when taking the tailings from ten stamps, than was had when both were in use, and taking only the tailings from five stamps each. Consequently but one machine was used for a time. The amount of concentrates saved under this plan was about 1000 pounds per twenty-four hours, of an average assay value of $100 per ton. The total saving by amalgamation in the battery and on the apron plates was about 70%, and about 22% by concentrates, making a total saving of 92%.

Although this was considered a very satisfactory showing for the class of ore, running as it did, between $11 and $12 per ton, one concentrator being idle, we decided to try running it tandem with the one in use, which we will call No. 1. Both being on the same level, a steam siphon was used temporarily, to elevate the tailings from No. 1 to No. 2. The result showed an additional saving of about fifty pounds of concentrates per twenty-four hours, having an assay value of about $80 per ton, the tailings from No. 1 machine assaying about 90 cents and those from No. 2 about 75 cents per ton.

As a further experiment the middlings from No. 1 machine were turned in with its tailings and allowed to go over to No. 2 machine, the middlings elevator of No. 1 machine being stopped.

This was an additional improvement, the concentrates from No. 1 being much cleaner, and their value raised from about $100 to an average of about $110 per ton. About 150 pounds of concentrates per twenty-four hours were had from No. 2 machine, having an average assay value of about $80 per ton, the tailings assaying about 50 cents per ton. The middlings elevator of this machine was run in the usual way.

The steam siphon pump, causing an appreciable difference in the amount of wood consumed (which in this instance cost $6 per cord), it was dispensed with by raising No. 1 machine about 4 feet above the floor, on cribbed timbers, to allow the tailings to flow to No. 2 by gravity.

The difference in the appearance of the pulp on No. 1 machine was quite noticeable after the middlings were sent over to No. 2. The line of demarkation between the sand and the concentrates was more clearly defined, the usual broad band of middlings being almost entirely absent. By keeping the machine in proper working order, the above described results were had, figuring from average monthly assays, checking up with the bullion obtained as well as the smelter returns from the concentrates afterwards received.

Having reached so satisfactory results, no further changes were attempted, lest we should be like the Eastern mining superintendent, who reported a prospective saving of 102%.

The samples were taken every hour, day and night, those from each shift being assayed separately.

In order to check the sampling, on several days the assayer took samples every half hour for the whole shift, the regular mill samples being taken at the same time as usual, every hour, both lines of samples being assayed separately, and checking up so closely as to prove they were correct. Even the tailings water was assayed separately in the search for any possible mistake in results obtained.

It may be stated, however, that the first month's run did not show a total saving of over 75%, and the results above named were only had after making some changes in the speed of stamps and arrangement of the mortars. During the time these results were had the amount of ore crushed did not exceed one and three-fourths tons per stamp per twenty-four hours. The ore of lower grade was held back and run through by itself at the rate of two and one-half to three tons per stamp per twenty-four hours, according to grade, with a corresponding lessening of the percentage saved, the tailings being kept at an average assay value of about 50 cents per ton for all grades. This was deemed best from a commercial point of view.

If we may be permitted to theorize from these facts, it would seem that, at least where a number of concentrators of the table type are used, that it would give better results to cut out the middlings from all but one, and send them over that one, keeping the concentrates so obtained in separate lots to be disposed of as their value would indicate.

It seems probable that a concentrator of the belt type might prove to be well adapted for a final separation of the middlings from the sand, as it would be a partially sized product as it left the table machines. Each type of machine seems to have merits of its own, which would indicate that when worked in connection with the other would give better results than either without the other. These are only suggestions, however, and remain to be proved by actual experiment, so far as the writer knows.

As the ore from different mines calls for treatment according to their different conditions and combinations, it should not be concluded, without actual experiment, that the above outlined arrangement of batteries and concentrators would produce the same results in all cases, but there are doubtless many classes of ore to which it could be applied with satisfactory results.

Mining in San Diego County, Cal.

TO THE EDITOR:—Tourmalines of all colors, and of every grade up to gems of great value, are being mined in San Diego county. The mineral lies in a belt running diagonally across the county. Beginning at Pala, near the lithia mines, it runs southwest across Mesa Grande and to the Mexican line near Potrero.

Fluorspar is also found near Potrero in large quantity and in the immediate vicinity of almost a solid mountain of spathic iron ore. Charles Raber located a number of claims on this mountain of iron and is sinking to test values as to depth. At Grapevine Springs, just east of Warner's ranch, numerous veins of graphite ore have been recently discovered which range from 10 or 12 inches to that many feet in width. Also there is one large deposit whose surface indications would lead to believe that a vein 200 feet in width lay beneath. These veins run northwest and southeast, are situated in a gold mining camp and, strange to say, some of them assay $4.50 to $5 per ton. The outcrop is quartz merely stained with graphite, and grows more graphitic with depth. At 10 feet it looks to be pretty nearly all graphite of the amorphous or nonfoliate variety. It has been tested here as a stove polish, a fireproof paint filler and a foundry facing, for all of which it seems admirably adapted. These claims are held and being explored by F. W. Carter of San Diego.

Immense reefs of low-grade gold-bearing quartz are found on the desert slope of the county at an elevation of about 4000 feet. The most notable one of these is known here as the Big Ledge and extends from Warner's ranch in a southeasterly direction to the desert, a distance of 15 miles. Many claims are being held on this ledge by the old hocus pocus method of relocation every other year in somebody else's name, or charging the Government $100 for camping on the claim the night of the 31st of December. Only one claim, that of W. R. Farnsworth, has been worked to any extent. A crosscut near the surface showed a quartz formation of 120 feet in width between a contact of granite and schist. A paystreak 12 feet wide at the surface of sulphurets carries $1 or $2 per ton. At the depth of 50 feet this paystreak had increased to $14 per ton.

The desert slope of this county is prospected after the most cursory fashion and is still a most inviting field for work.

San Diego, April 5.

Texas Fuel Oil Tests.

Prof. J. E. Denton of Stevens Institute reports some tests made by him of crude petroleum as fuel at Beaumont, Texas. The tests were made in a horizontal return tubular boiler 6 feet in diameter, 18 feet long, and having a grate surface of 45.5 square feet. In the tests data for comparative purposes were obtained from the same boiler when burning buckwheat anthracite coal. With Beaumont crude oil the equivalent evaporation from and at 212° was 15.49 pounds of water per pound of oil. The corresponding figure when using buckwheat coal was 11.79 pounds of water per pound of combustible, and 8.94 per pound of coal. The efficiency of the boiler determined by the oil tests was 78.5% and by the coal tests 77.6%. A quantity of steam varying from 3.1% to 4.8% was consumed in the oil blast. In the two tests with coal the horse power developed by the boiler was 92.6 and 119.1. In the five tests with oil the horse power varied from 112.7 to 220.1, the evaporation per pound of oil from and at 212° in the first mentioned case being 15.05 and in the second 14.75.

THE Senate Committee on Mines and Mining has under consideration a bill introduced by Senator Kearns of Utah to amend the mining statutes affecting the description and measurements of mineral claims. The bill provides that the locator or possessor of a claim shall have the exclusive possession and ownership of all the surface thereof, and all veins or lodes therein contained within the surface lines thereof extended vertically. It is believed the bill will be reported favorably.

A Suggestion Relating to the Cyanide Process.

TO THE EDITOR:—The latest variation of the cyanide process in successful practice is one in which the zinc shavings are coated with a film of lead, so as to form a galvanic couple. This recalls an incident of the early electric light days, when cheap, simple primary batteries were sought for for domestic use. My battery was zinc and cast iron in a solution of caustic potash. At first, an iron pot holding the solution, the zinc suspended in it, was the complete cell unit. An improvement was the increase of iron surface by the addition of cast iron chips, picked up under a turning lathe, put in the pot. Next a zinc cell held the solution and a porous bag held the chips; then a wire netting held the chips; finally a roll of iron netting, pressed flat, and a sheet of zinc, in a glass cell holding the solution, was arrived at. The addition of a very small quantity of permanganate of potash gave a great increase of current for a short time. This cell was efficient and reliable for a time, but finally it would stop giving current; and here is the point I wish to bring to notice: On examining the cell, I found the iron galvanized, beautifully plated with zinc, so that I placed it with a new clean iron and obtained a good current from it until the zinc plating was eaten through.

Now, if the coating of the zinc with lead forms an effective galvanic couple, hastening the precipitation of the gold from KCy solutions, then iron and zinc, being a much stronger galvanic couple, would seem to be a much more efficient precipitant.

I am not cyaniding, nor is anyone near me doing it, but the matter can be easily tested by some one who is cyaniding by following this method: Get a dozen yards of closely woven galvanized iron wire netting; fold it in layers a foot wide, backwards and forwards, one fold above another; then press it to a close mat and bind fast. Put this mat in a barrel; set the feed pipe at the bottom, the outlet near the top; then turn on slowly the gold-charged cyanide solution. After running awhile, test the outflow for gold; if none is present, increase the flow, and so find the rate of deposition. Run until the zinc is eaten through in spots; probably a blue tinge in the solution will indicate this; then wash the mat clear of the precipitate and take it out. Assay the precipitated gold for presence of zinc; probably none will be present.

Now, following out my zinc-iron cell experiences, determine the best conditions for plating the iron netting with zinc; put the well washed mat from the barrel into the plating cell, and, recoating it with zinc, make it ready for use again. From the data thus obtained, if favorable, the size and number of mats needed, the replating cells, etc., for any output may be calculated. The advantages that would seem to be offered are: No loose zinc, no cutting into shavings of highly finished sheet zinc, no zinc mixing with the precipitated gold, and the cheapest form of zinc-smelter pig for plating. The wire mats are easily made, easily washed, easily handled and easily examined. There would be no royalty tax on process, and it is possibly a more economical means of precipitating easily cleaned gold from cyanide solutions.

JOSEPH VOYLE.

Copper Statistics From Germany.

Advance figures of comparative annual production and consumption of copper compiled by Aron Hirsch & Sohn of Halberstadt, Germany, are as follows:

	1901. Tons.	1900. Tons.	1899. Tons.
Estimated consumption of copper in Germany	89,548	116,900	102,618
Imports from the United States	42,422	66,264	47,742
German copper production is estimated	30,333	32,423	37,676

The German consumption for different purposes is estimated as follows:

	1901. Tons.	1900. Tons.
Electrical purposes	28,000	43,000
Sheet copper	16,000	18,000
Brass and wire	30 000	35,000
Chemical purposes	2,000	2,000
Ship building, railroad and casting	18,000	19,000
Totals	90,000	117,000

The total production of the world is estimated at 502,704 tons for 1901, as against 486,084 tons for 1900.

The increase from Canada is estimated as only 1400 tons, which is probably under estimated by possibly 7000 tons.

The copper consumption of the various consuming countries is estimated as follows:

	1901. Tons.	1900. Tons.
Germany	89,548	116,900
United Kingdom	107,021	112.908
United States	175,800	166,140
France	46,180	61,832
Austria	21,016	22,704
Totals	439,565	480,484

An Inexpensive Engine Railing.

By W. H. WAKEMAN.

Laws enacted by some of our Legislatures require the owners of steam plants to provide railings around their engine flywheels, which will protect employes and visitors from accidents caused by coming in contact with these swiftly revolving wheels. It is the business of an inspector to see that every flywheel, not otherwise closed in, has a railing around it that insures safety, and here his duties end. It is the object of this article to show how a good railing was provided at small cost.

An estimate of the cost of brass railing, with suitable trimmings, was secured, but inasmuch as it was prohibitive for this place the writer concluded to use iron pipes and fittings with a brass ornament for each post, as the next best thing.

Fig. 1 is a plan of the engine room, showing the location of the engine, pump, etc., and railing as required. Between the outboard bearing of engine and pump there is a passageway much used by visitors and others, therefore the railing is located 32 inches from the center of this bearing, making it inconvenient for those passing by to meddle with the slight feed oil cup on it.

The railing is 36 inches from the main belt on this side, as it is desirable to have it farther away here than on the other side of the belt.

A study of the plan will show that no unions or left hand threads are required in order to connect the horizontal rails, but after one rail was completed with posts 21 inches high to center of rail, another line of rails was laid out and connected, just the same as the first. To support this second line the posts were raised 16 inches, making it 37 inches to center of upper rail.

When the second length of pipes comprising the

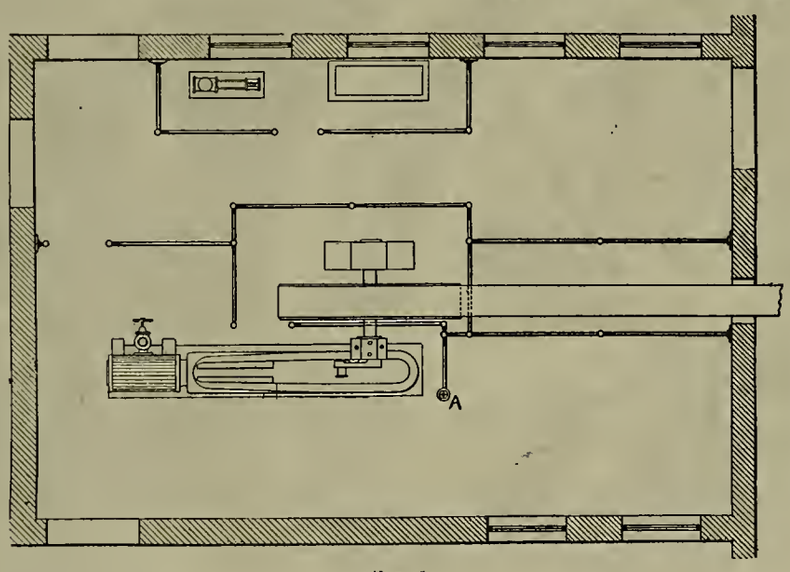


FIG. 1.

posts were to go on it became necessary to use unions or else provide fittings in one of the lines with left hand threads. The latter plan was adopted as having the best appearance when finished.

One-inch iron pipe, with malleable iron fittings, was used, which appears very neat, but when bought all of these fittings were tapped with right hand threads.

This point is specially mentioned because when engineers find that no left hand malleable iron fittings are available they sometimes use cast iron ones instead, as they can easily secure them, but when two kinds of fittings are used on one job it makes the whole look like a misfit or something worse. To overcome this difficulty it is only necessary to take a left hand pipe tap and use it on the fittings the same as if they had never been threaded at all. The result will be a clean thread except at two points opposite each other, where the left hand cross the right hand threads, and either a right or a left hand threaded pipe can be screwed into the fitting at pleasure.

This plan is recommended for railings. If anyone wishes to try it for other work they have the privilege of doing so, but it is not warranted to be satisfactory.

The top thread on each post was cut left-handed, so that when the upper rail was placed in position, and the upper half of each post screwed down into the lower half with a right hand thread, the left hand threads were also engaged in the upper fittings, thus making each post complete and at the same time fastening the upper rail in place and completing the job. The threads on all these joints are nicely covered, so that it is impossible to tell (without unscrewing a joint) where the left hand threads are.

The top of every post in this railing consists of a tee, a cross, or an ell, with slide outlets, and into each is screwed a brass acorn, nickel plated, except where there was a good reason for using something else, thus greatly improving the whole, and giving it a finished appearance. All of the iron work was given two coats of first-class black paint, followed by two coats of varnish, giving it a glossy and smooth surface that is easy to keep clean.

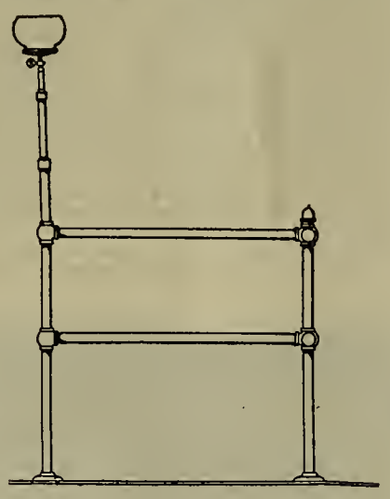


FIG. 2.

Fig. 2 illustrates a gas light located at the point A in Fig. 1.

A $\frac{3}{8}$-inch gas pipe was run up through the floor and continued inside of the post, terminating in a burner as shown.

Fig. 3 illustrates an entrance for the engineer's

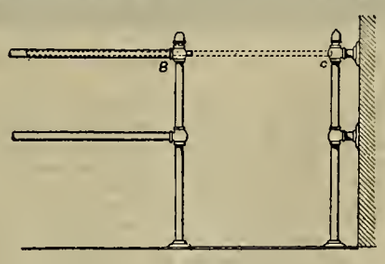


FIG. 3.

use, with means for closing the same. A piece of round iron about 2 inches long was inserted in the end of a $\frac{1}{2}$-inch pipe and welded there so as to make the end solid. Holes of suitable size were then bored in the posts B and C and $\frac{1}{2}$-inch pipe inserted in them. When this is wide open the $\frac{1}{2}$-inch pipe projects out of the post $\frac{3}{16}$ inch, which is enough to afford means for drawing it out, yet is not sufficient to be unsightly or otherwise objectionable.

Such a bar for closing the entrance is often convenient to remind visitors that while they are always welcome, outside of the railing is the most suitable place for them.

While making this railing it was necessary to cut 177 threads on 1-inch pipe, of the ordinary length for pipe fittings, and as this called for much hard labor if done by hand, the following plan for making it easier was adopted: Both handles were removed from the die stock, which was then fastened to the face plate of a lathe, as shown in Fig. 4.

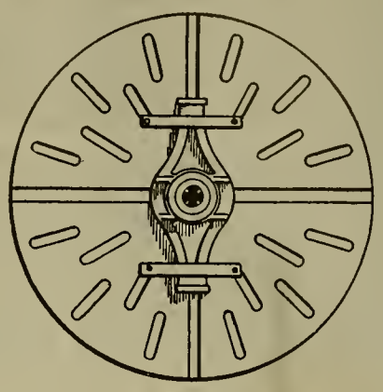


FIG. 4.

A proper support for the other end of the pipe was provided, so that when inserted into the die stock and the lathe started a thread would be cut with very little labor. The pipe was prevented from turning by means of a Stilson wrench, the handles of which rested on the lathe bed while cutting the thread. It was reversed and held by hand when running the die stock backwards.—Electricity.

Assaying Sulphide Ores.

TO THE EDITOR:—Referring to the communication in your issue of March 22, under title "A Trouble in Assaying," I think your correspondent can easily satisfy himself that the best way to assay sulphide ores is by the aid of nitre as a desulphurizer. My experience is that nail assays for sulphide ores are always troublesome and unsatisfactory, and I never use them. To properly roast an ore requires considerable time and care, as well as fuel, so one could not run an assay in this way at commercial rates without its costing more than he could obtain for it. If he is running assays for himself, then he should value his own time. However, if he favors roasting, let him weigh out half an assay ton and roast carefully either in cupel furnace, in roasting dish or in crucible. The latter is, perhaps, the quicker method. To the charge of pulp add one-fourth assay ton of charcoal. Thoroughly mix and place in a new crucible. The charcoal prevents matting of the charge. Subject to heat until all sulphur is eliminated. Cool crucible slowly without taking pulp out. Then flux as follows:

Soda, bicarb.	20 grams	= 1 teaspoonful
Borax	½ assay ton	= 1 teaspoonful
Litharge	1½ assay ton	= 1 teaspoonful
Silica	20 grams	= 1 teaspoonful
Argols	2 grams	

Mix and cover with teaspoonful of salt.

I would never go to the trouble to roast, but for an ordinary base ore I would take half an assay ton of the raw pulp, flux as above, except leaving out the argols, and I would increase the litharge to two assay tons and put in ten grams nitre.

If the ore is very base, containing practically no gangue, I would increase the litharge to two and one-half or three assay tons, silica to thirty grams and nitre to fifteen grams.

A graduate of Freiberg would say that the roasting system is "the easiest and surest method known to metallurgy," but if your correspondent will run assays both ways and see how results check I am satisfied he will find that by fluxing direct, varying the amount of nitre till he gets a button of proper size, he will secure results that will be more satisfactory than by roasting, and at less than one-fourth the time and expense. Furthermore, his pours will be as nice and perfect as from ordinary siliceous ores.

The silica used in above is broken glass, crushed to pass a twenty-mesh screen. It works more satisfactorily than the regular powdered silica.

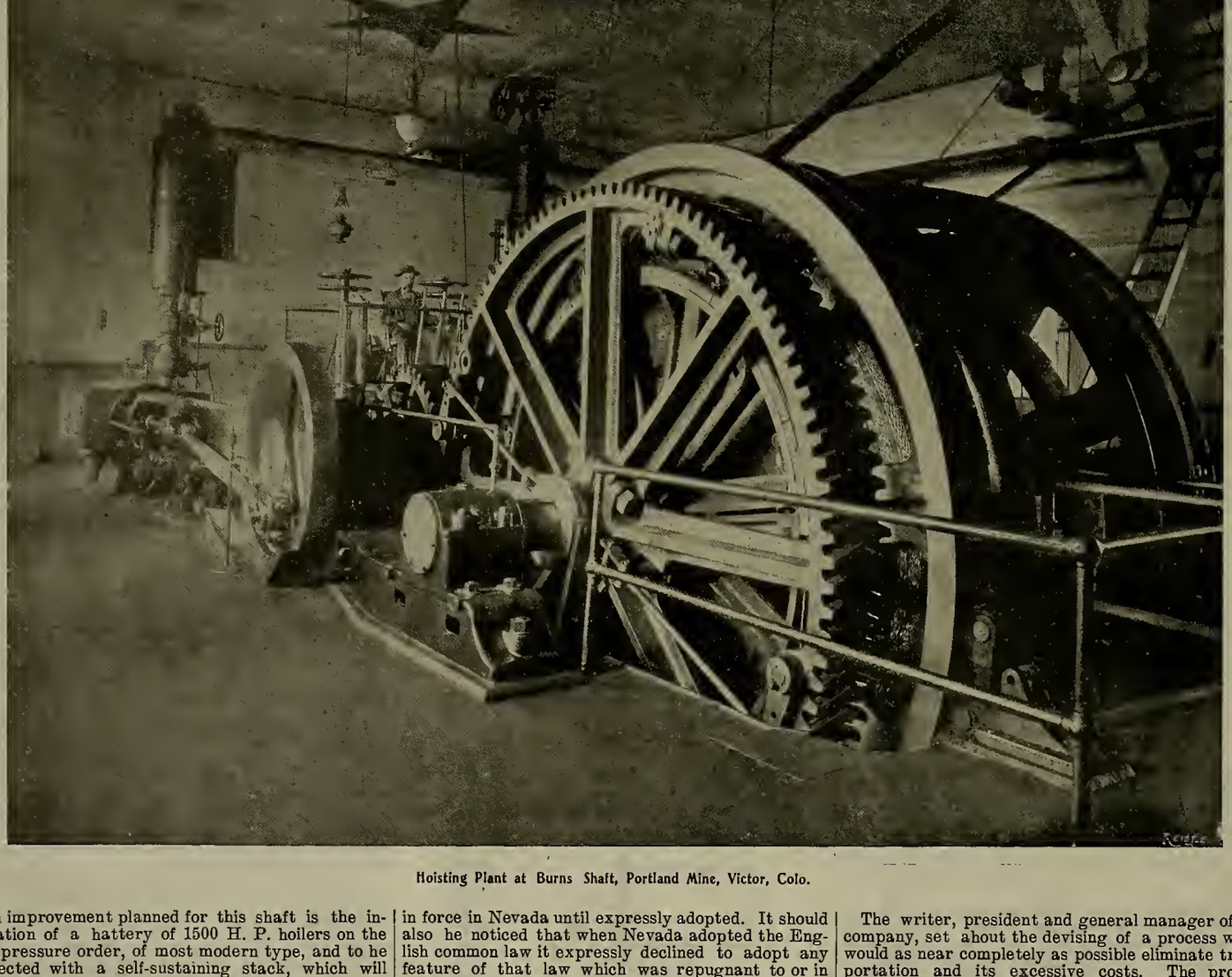
One of the best custom assayers in Montana estimates the amount of nitre needed to oxidize the sulphurets by taking a teaspoonful of the pulp in a small gold pan, flushing the lighter part to one side and then estimating amount of concentrates shown. If pulp seems half sulphide, he uses 210 grains (thirteen and one-half grams) nitre; if one-fourth sulphide, 105 grains, etc. This is a practical and quick way of forming an estimate and saves running preliminaries. He seldom misses fluxing his ore correctly or getting proper sized button on first guess. The novice may guess a few in this way and run preliminaries with them. In a little while he can easily tell the exact amount of nitre needed. The assayer above mentioned uses less litharge and silica than I recommend, but takes longer time for fusion. I consider extra cost for flux is more than offset by saving of time in securing a melt.

Helena, Mont., April 5. MATT. W. ALDERSON.

The Portland Gold Mine at Victor, Colo.

The Portland gold mine at Victor, Colo., is a typical Cripple Creek district mine and at the same time one of the leading mines of that district. In its present shape it represents the consolidation of thirty-six mining claims and fractions, covering nearly 200 acres of surface. The mine has many miles of underground workings and is equipped with large plants of machinery.

Notable among this machinery is the hoist and air compressor, views of which are shown, and which are installed at the Burns shaft, which has attained a depth of 1080 feet. The hoist is equipped with double-deck cages and has a capacity of 4500 feet depth and a maximum lift of 1000 feet per minute. The hoiler room contains five hatteries of two hoilers each, making a total of 1000 H. P. The two air compressors have an aggregate capacity of forty-six drills. There are two dynamos with a combined capacity of 1050 lights, as well as one extra 10x12 hoisting engine, used for the third compartment of the shaft for repairing steam, air and water columns.



Hoisting Plant at Burns Shaft, Portland Mine, Victor, Colo.

An improvement planned for this shaft is the installation of a hattery of 1500 H. P. hoilers on the high pressure order, of most modern type, and to he connected with a self-sustaining stack, which will dispense with the old hattery now in use.

In connection with the shaft there are ore houses so arranged that the ore passes hy gravity over the sorting tahles, where a large force of ore sorters are kept at work, thence by gravity to the railroad cars, where they are weighed on company's track scales.

Grouped in convenient proximity to this shaft are the carpenter, machine and hlacksmith shops, all equipped with up-to-date machinery.

There is now being erected an ore washing machine on an improved pattern of the one now in operation at the No. 2 shaft.

ALL other things heing equal—adaptability, soundness, efficiency—the engineering work which costs the least money is the hest. I do not know of any other product of man's creative powers of which the same can be so truly said. The "cash" basis is the real foundation upon which the engineer builds, and this consideration draws us at once from judging engineering as merely something cleverly done hy an ingenious person. It also very often serves to distinguish hetween college, textbook or rule-of-thumb engineering aud the real thing.—James Mansergh, in Cassier's Magazine.

Extralateral Rights Under Prior Patented Land.

Written for the MINING AND SCIENTIFIC PRESS.

In considering the legal aspect of the very interesting case of Wedekind vs. Bell, concerning the Reno Star mine at Reno, Nev., certain features of the local laws of Nevada have heen heretofore overlooked. The real foundation of that litigation lies in the contention of Wedekind, the discoverer of this mine, that under the common law, as the same is in force in Nevada, he has a right to follow his vein wherever it may go. Heretofore, where the question of extralateral rights under prior patented land has heen considered, it has heen assumed, without discussion, that the rule of the English common law, that to whoever owns the surface helongs all that lies heneath it, is a rule in force and applicahle to those cases. The correctness of that assumption, when applied in Nevada, is the very gist of this controversy.

It will he recollected that the State of Nevada was organized in 1864 out of territory formerly helonging to Mexico, and that the English common law was not in force in Nevada until expressly adopted. It should also he noticed that when Nevada adopted the English common law it expressly declined to adopt any feature of that law which was repugnant to or in conflict with the laws then existing.

Mining had heen carried on in that region long hefore the State was organized, and the Pacific coast customs of miners were in force and had heen recognized by hoth the legislative and judicial departments of the Government. It is a generally recognized feature of those customs that the miner who owns the apex has the right to follow the vein upon its dip, without regard to the ownership of the surface of the adjoining land. That heing a common law of the miners and a part of the common law of the Territory and of the State when it adopted the English common law, that rule of the English common law (upon which the Bell people rely) it is claimed hy Wedekind never was adopted, hecause it is directly in conflict with the then existing Nevada common law, which recognized extralateral rights in all instances.

In other words, there was in that Territory a recognized system of customs and usages, under which the owner of the apex could follow his vein on its dip, constituting a common law of property, which the English common law never supplanted. It is generally recognized that there is no national common law, and that the common law in force in one State frequently is not in force in another. It is not questioned in this case hut that the Government has parted with its title to the mineral and the land ahove it. The main issue is, what rights has the owner of the surface of the land to the mineral heneath it, under the common law in force in Nevada? It is a local rather than a federal question.

The Fleming Leaching Process for Sulphide Copper Ores.*

Written for the MINING AND SCIENTIFIC PRESS by J. A. FLEMING.

Several years since the writer, associated with Eastern people as the Black Warrior Copper Co., bought 1700 acres of copper claims near Globe, Ariz., and has since then heen engaged in developing the property and perfecting the process of reduction devised hy the writer to meet the special conditions.

Owing to the location of the mines, transportation was extremely expensive and made the cost of fuel so considerahle that the employing of the customary furnace methods of reduction was out of the question. The mine could not stand the drain of these cost charges.

The writer, president and general manager of the company, set ahout the devising of a process which would as near completely as possible eliminate transportation and its excessive costs. The process devised and now in profitahle every-day operation does this. Nothing is transported but refined ingot copper from the mine and scrap iron to it. Later the latter is to he eliminated hy making the iron direct from the ore at the mine.

The process is an imitation of one of nature's own methods. The crude sulphide ore is roasted hy the heat supplied by the comhustion of its own sulphur. This roasting is done in closed kilns, and the sulphur is suhsequently converted after leaving the kilns and passing into lead lined chamhers into sulphuric acid. No fume from the roasting of the ore is wasted into the atmosphere, and the destructive effects of the sulphur fumes on vegetation are thus entirely ohviated.

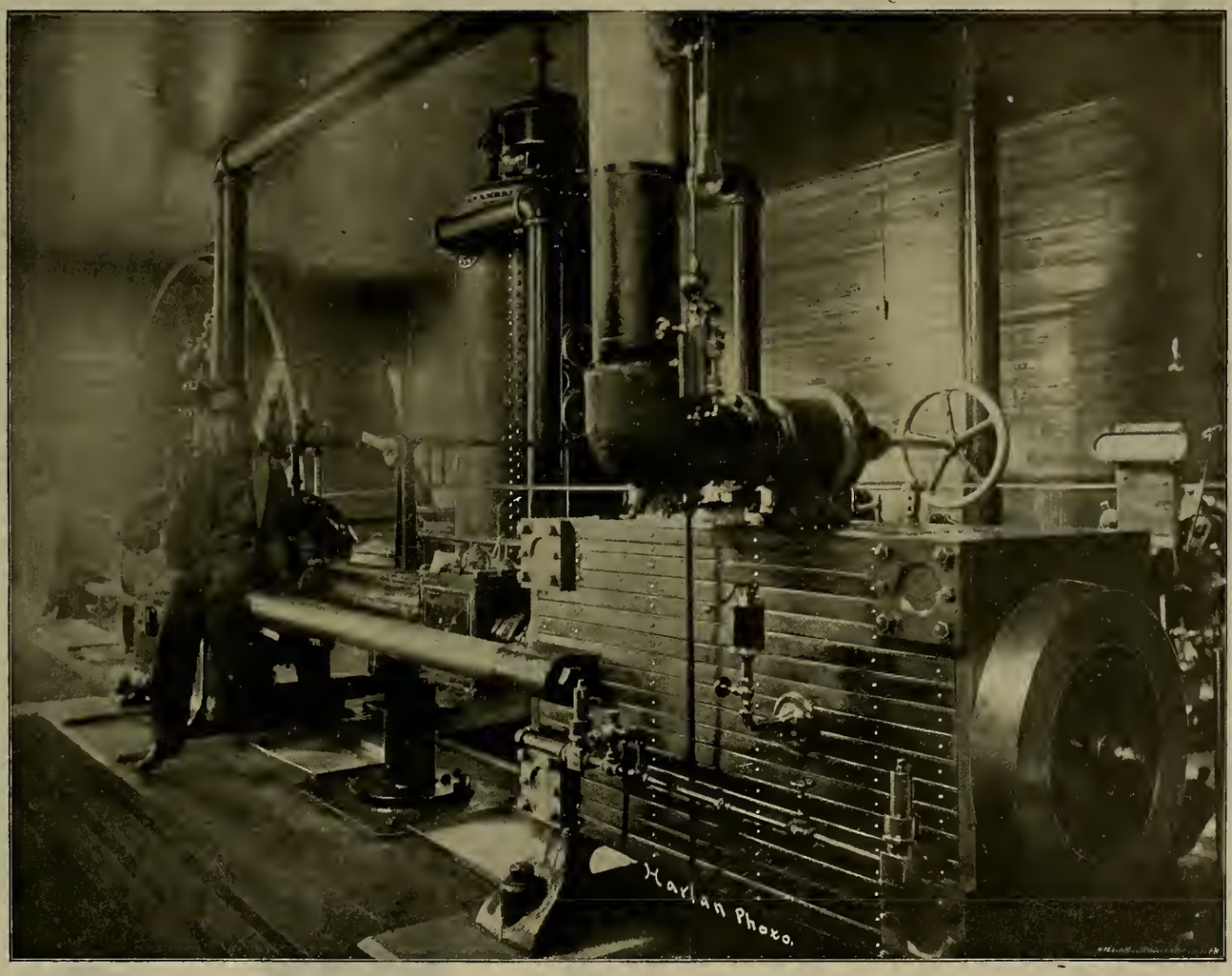
The sulphuric acid so made is then used to leach out the copper in the roasted ore. After leaching, the tails from the vats are treated by amalgamating and cyaniding to recover the gold and silver values, and the final spent tails, consisting of oxide of iron and silica and other gangue materials, with a trace only of copper, go to the waste dump. The copper solution is conducted to precipitating tanks, and the

*See illustration on front page.

copper precipitated by scrap iron is collected, melted in a melting furnace, poled and cast into ingots. The copper made goes 99.76 fine.

The process, which is described so briefly, is not by any means new in its chemistry, but, as developed at the Black Warrior works, is the result of cut and try methods extending over five years. In its final shape as now in operation it is exceedingly simple and the manipulation is almost exclusively mechanical and largely automatic. It does not require a chemist or skilled labor. Ordinary labor, largely that of boys, open and close valves, pull levers, and take the temperature of the solution from time to time. Two men on a shift tend to the roasting and acid plant, working through 150 tons of ore daily. The plant is almost indestructible so far as the ordinary wear and tear of commercial operation is concerned. With 7% copper ore the cost of making copper I estimate as about half what it could be made for by the usual smelting method.

The illustration accompanying this is a view of the works at Black Warrior. They have been in operation for three months now and the results obtained are satisfactory and all that were anticipated. The process is well adapted to the conditions under which we are producing copper. It made us entirely independent of custom smelters and refineries, and very nearly independent of railroad transportation. It is particularly adapted to low-grade copper sulphide deposits and to small mines.



The Big Compressor, Portland Mine, Victor, Colo.—(See Opposite Page.)

Power Required to Deposit Copper by Electricity.

Written for the MINING AND SCIENTIFIC PRESS by T. K. WILKINSON.

It is not possible to state any definite figure for the power required to deposit copper by electricity, because the amount required to deposit a given quantity in a given time will vary according to the current density. By current density is meant the number of amperes per square foot of depositing surface.

For illustration, take the actual working results obtained in one of the large electrolytic copper refineries. A current of 4000 amperes at 65 volts pressure (260 kilowatts) deposited in 200 tanks 44,000 pounds per twenty-four hours. Therefore, 2 kilowatts deposited 14.1 pounds per hour. Current density was 12 amperes per square foot. By reducing the current to 2000 amperes, the voltage would fall to 32.5 (65 kilowatts), and the amount of copper deposited per twenty-four hours would be 22,000 pounds; so that in this case 1 kilowatt would deposit 14.1 pounds per hour; current density, 6 amperes per square foot.

From the above figures it will be seen that whereas in one case 2 kilowatts deposited 14.1 pounds per hour, in the other case it required but 1 kilowatt to deposit 14.1 pounds per hour; but in the second case, were it desirable to produce 44,000 pounds in twenty-four hours, at the lower power cost, it would be necessary to employ twice as many tanks. By reduction in the rate of deposition, 1 kilowatt per hour can be made to deposit increasing amounts of copper; but the size of the plant will increase at the same time, and it will be necessary to stop the increase in the size of the plant at the point where the saving in power and the interest on the investment in the larger plant meet. Accordingly, the size of a refinery will depend largely on the cost of power. At present there is but one refinery in the United States where power is so cheap that the plant can be small and the rate of deposition high. That is at Great Falls, Mont., where the Boston & Montana Copper Co. use the water power of the Missouri river. All others use steam power, and a current density of 10 to 15 amperes per square foot is the usual practice in these steam power refineries. As steam power is much more expensive than water power at Great Falls, all the other refineries are larger in proportion to their production than the Great Falls plant.

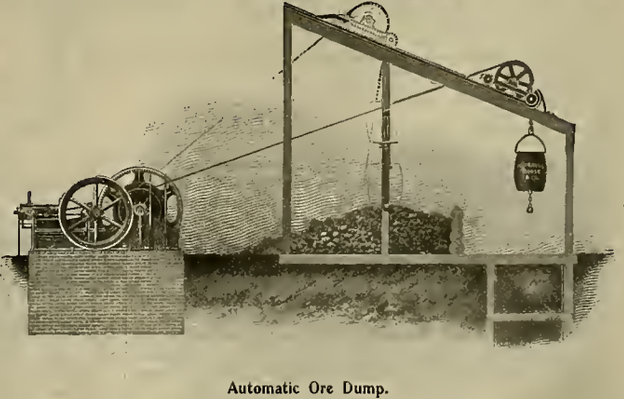
In any refinery the care given to details in consumption of power will have an important bearing on the result, and, other things being equal, the plant in which the closest attention is given to the condition of conductors, contacts, composition and temperature of electrolyte, etc., will show the lowest power cost. Here in California electrically transmitted power should be cheaper than steam power, and, as far as cost of operation is concerned, a refinery on San Francisco bay ought to compete favorably with the Eastern refineries.

PROF. E. D. CAMPBELL of analytical chemistry in the University of Michigan is making a series of experiments on Portland cement that will take years of labor before finally completed. Prof. Campbell has devised a furnace in which the factors of time and temperature can be absolutely controlled, and his test will cover Portland cement manufacture from every variety of rock and clay used.

Fairbanks-Morse Automatic Ore Dump.

The automatic dump herewith illustrated is an improved device for accomplishing the dumping of a mine bucket in a simple, reliable manner. It also, of manufacturers claim, removes a possible danger thethe bucket falling back into the shaft, and being automatic saves the service of the man ordinarily required for dumping a bucket.

Referring to the cut it will be noted that the cable runs over a removable sheave in the same manner as over a fixed sheave used in the ordinary gallows frame. With this device, when the bucket reaches the proper position, the carriage or trolley carrying the sheave moves up the track, which is inclined, until it is caught by the hook as shown by the dotted lines. The movement of the trolley up the incline with the bucket is so arranged as to land the bucket on the platform, as shown on the middle upright post. This platform is arranged with a slot which is formed in such a manner that the chain on the bottom of the bucket passes into the slot, then by relieving the clutch mechanism of the hoist, allowing the drum to slacken the cable, the platform on which the bucket rests then automatically dumps. This is arranged for by the bearings carrying the platform being out of the center and the weight of the bucket immediately overbalances the dump as soon as the hoist is lowered. The ball on the end of the chain, attached to the end of the bucket, holds the bucket while it is being dumped. When the bucket is empty



Automatic Ore Dump.

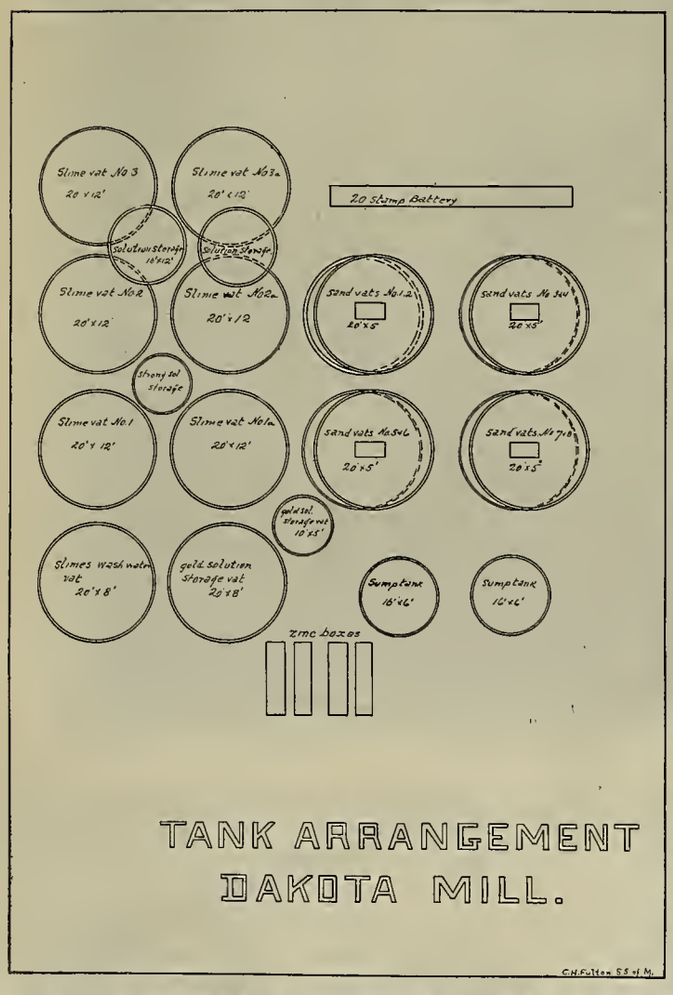
the hoist again pulls it back into position until it reaches the trolley, when the hook which holds the trolley and bucket back in its position over the shaft and the bucket is lowered down into the shaft. This arrangement permits the setting or adjusting for various positions of the shaft and hoist, and the dumping into different compartments, and by means of chutes under the control of the man at the hoist, or hy the use of tram cars, the dump can be placed at almost any desired point. In constructing the gallows frame no more timber is required than would be used in the common frame.

Additional information concerning the working of this device will be given by Fairhanks, Morse & Co., Chicago, the manufacturers.

The Cyanide Plant of the Dakota Mining and Milling Company.

This cyanide plant is situated in the First Ward of of Deadwood, South Dakota, and is the most recent plant but one to begin operations. It was constructed during the summer and fall of 1901 and went into commission in October. The mill is a wet fine crushing mill, having a capacity of sixty tons in twenty-four hours.

THE CRUSHING OF THE ORE.—The ore goes from the bins, which are filled from railroad cars, to a Gates No. 4 D crusher, passing, however, first over the grizzly. The crushed ore is carried by elevator to the main storage bins, from which it is fed by suspended Challenge feeds to four 5-stamp batteries. The weight of the stamps is 900 pounds, the crushing being done through a 20-mesh woven wire screen. The mortars have a double discharge, and instead of being the ordinary lip mortar are provided with a gutter below the screens, cast as one piece with the mortar. These gutters take the pulp discharge from the batteries and send it to the charge box of the spiral pump. A heavy canvas is hung over the screen and gutter to prevent splashing.



The pulp from the batteries is lifted by a Frenier sand pump (capacity 6000 gallons per hour) to the launders feeding the separator boxes. The height of lift is about 17 feet. The separator boxes, which separate the sands and slimes, are 5x4 feet in cross section and 5 feet deep. The slimes in the overflow go to the slimes vats, while the sands are discharged at intervals into the vats directly below the boxes.

THE TANK CAPAOITY OF THE MILL. — There are eight leaching vats, huilt in four tiers of two each, for the double treatment of the sands. The vats are of red cedar, 20 feet in diameter and 5 feet deep. The sands, after leaching in the upper vats, are discharged into the vats beneath by hottom discharge gates.

There are six slimes vats, built in two rows of three each, each three vats comprising a unit for the treatment of one lot of slimes. The vats are 20 feet in diameter and 12 feet deep, 2½-inch staves, and built of red cedar. There are two sump tanks, 16 feet in diameter and 6 feet deep; two gold solution tanks, one 20 feet in diameter and 8 feet deep, the other 10 feet in diameter and 5 feet deep. Then there are two weak solution storage tanks, 16 feet in diameter and 12 feet deep, and also a strong solution storage tank, 12 feet in diameter and 7 feet deep. All these tanks are of red cedar. There is one tank 20 feet in diameter and 8 feet deep used as a settling tank to settle out sediment from the syphoned slimes solution.

THE TREATMENT OF THE SANDS.—The sand vats are charged in about twenty-four hours, hy means of the separator boxes, and the pulp is then leached with a 0.2%, or four-pound cyanide solution, followed by the weak solution of two pounds per ton. The sands are then transferred, by shovelling through the bottom discharge gates into the second vat below. The transference takes ahout twelve hours and costs about 5 cents per ton. In the second vat the sands are leached again, the extraction made by the second leaching being about 8%. The tailings are discharged by sluicing, the time consumed in discharging heing about two hours. The total time consumed in treating sands, including charging and discharging vats, is five days. The extraction made on sands varies with the different ores treated, averaging about 83% to 84%.

THE TREATMENT OF THE SLIMES. —The slimes, coming from the separator boxes, flow into one of the two lowest slime vats (Nos. 1 and 2 on tank plan). When one of these vats is filled (the filling being done by carrying the slimes to the bottom of the vat by a wooden pipe), the syphon is started and the solution syphoned off, fresh slimes pulp meanwhile running into the vat continually. This can be done, as the slimes settle very rapidly with most of the ores treated at the mill. When so much slime has been charged into the vat that the syphoned solution begins to be seriously discolored, twenty-five pounds of slacked lime are fed in to the launder taking the slimes overflow from the separator boxes, and when this has been carried into the slimes vat, the pulp is changed into the lowest slime vat of the second unit, where the above operation is repeated. The slimes in vat No. 1 are then allowed to settle for one hour, when the syphon is again started, and now follows the settling of the slimes down until the solution has been drained within a few inches of the settled slimes. The total time of settling is ahout ten hours. The settled slimes in this vat are now sluiced out with "barren solution" to the centrifugal pump, which lifts the material to the next slime vat of the unit. When the vat has been filled the pulp is drawn off at the bottom by the centrifugal pump and returned to the vat over the top. This circulation is carried on for an hour. Then the slimes are allowed to settle, the clear solution at the top being syphoned off during the settling. When the slimes have settled, fresh barren solution is added and they are circulated by the centrifugal pump for another hour, twenty-five pounds more of lime being added in the course of the pumping. The slimes are then again allowed to settle, while the solution is syphoned off as before. When settling is complete the slimes are sluiced out with wash water to the centrifugal pump, which now raises the pulp to the last slime vat of the unit. Here the slimes are allowed to settle again and the solution syphoned off. After the solution has been drawn off wash water is added by a nozzle and pipe device situated in the vat. This serves to thoroughly wash and agitate the slimes for the last time. The slimes are now allowed to settle, while the solution is drawn off by the syphon. Then the slimes are sluiced out to waste, having passed through three vats. Through the syphon used the discharge pipe passes out through the side of the vat. The extraction made on slimes is about 88%, but at present only about 80% to 82% is saved, the halance passing out in the tailings in the retained moisture. More thorough washing, with facilities for handling the increased bulk of wash water, will undoubtedly raise the percentage saved. The total time consumed is about six days.

THE PRECIPITATING DEPARTMENT.—Precipitation is carried on in four zinc boxes, two for syphoned solution and two for sands solution. They are ten-compartment boxes, each compartment having a cross section of 20x15 inches and a depth of about 18 inches. Some extra precipitating barrels are being put in to accommodate an increased amount of solution. The precipitates can be sluiced from the boxes to the acid treatment tank, where they are washed and treated with dilute sulphuric acid in the usual way, transferred to a filter tank, filtered, washed and dried, and then smelted. The slags are treated at the Golden Reward smelter.

The precipitation in the boxes is good for both sands and slimes solutions, the slimes solutions usually carrying from .05% to .08% free cyanide. Considerahle sediment sometimes accumulates in the boxes, but does not seem to give any trouble in precipitation.

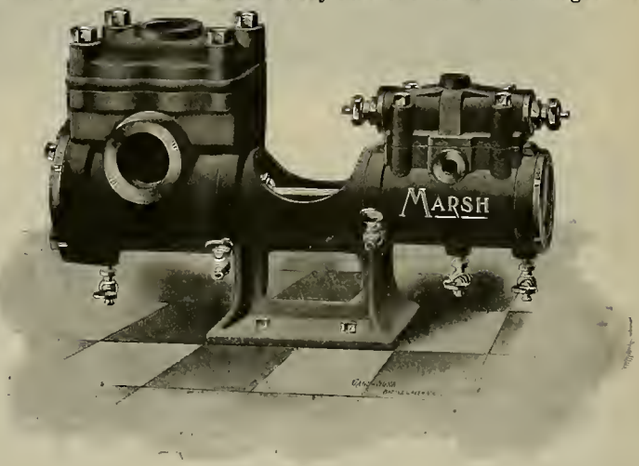
THE NATURE OF THE ORE TREATED. — The ores treated at the mill come mainly from the vicinity of Portland, and are siliceous Potsdam ores, with the values very finely distributed. The mill also treats custom ores to a considerable extent. Recently some siliceous ores have been treated which were but slightly oxidized, seemingly with considerable success.

The method of slimes treatment described is due to Mr. Empson, the superintendent of the mill.—From Bulletin No. 5 of the South Dakota School of Mines.

Direct Acting Pumps for Cyanide Plants.

In some plants, both of large and small capacity, it is often inconvenient to install centrifugal pumps on account of distance of the desired location of pump from the source of power, steam engine line shaft, etc., or the first cost of such an equipment is considerahle. The Simonds Saw Co., agents of the Marsh steam pump in California, have designed a pump which they consider peculiarly well adapted to such stated use. These pumps range in capacity from 200 gallons of solution per hour upward, and the solution end including piston, valves, piston rod, etc., are of selected materials to combine resistance to chemical action and mechanical wearing qualities.

The Marsh cyanide pump is illustrated herewith, the cut giving a good idea of its compactness. The manufacturers say that two of its advantages are absolute regulation under varying loads and economical use of steam (or air)—only sufficient steam being admitted to do the work—and impossibility of the pump running away or racing when the suction is lost in any way. The Marsh cyanide pump may be seen at Simonds Saw Co., 33 Market St., San Francisco; its agents will furnish descriptive matter on any of their goods.



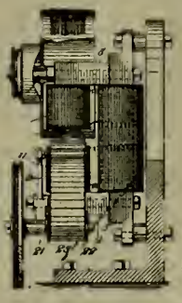
Marsh Cyanide Pump.

Mining and Metallurgical Patents.

Patents Issued April 8, 1902.

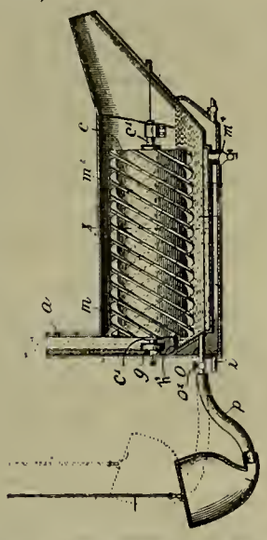
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

ORE SEPARATOR.—No. 697,351; J. M. McClave, F. H. Kirby and E. R. Cumbe, Denver, Colo.



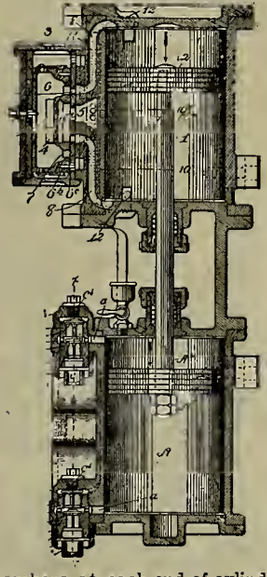
Electromagnets of opposite polarity, revolving drum movable between poles of magnets, one magnet being arranged within drum, series of shoes or pole pieces attached to magnet within drum and having ends extended beyond magnet in direction of rotation of drum, bands of magnetic material surrounding drum, carrier belt movable between drum and lower electromagnet and swinging frame on which belt is mounted.

AMALGAMATING MACHINE. — No. 697,176; G. C. Scott, Columbus, Ohio.



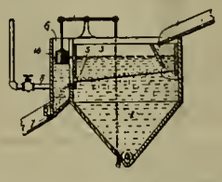
Casing having inlet opening at one end and outlet opening at other, amalgamating body rotatably supported within casing and adapted to run in body of mercury contained within casing, pipe section o leading outward from body of mercury, mercury reservoir or holder, means for raising holder to higher level than pipe section and lowering it to level below that of pipe section and flexible connection between outlet pipe and reservoir.

AIR COMPRESSOR.—No. 697,414; Frank L. Reeder and A. B. Freville, Louisville, Ky.



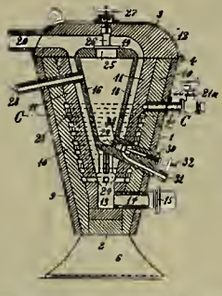
Valve chambers at each end of cylinder, passages connecting each end of cylinder with chambers, passage connecting chambers, which have each interior annular groove registering with passage connecting chamber and cylinder, and integral double valve seat bushings having tapered threaded engagement with chambers, bushings have perforations registering with interior grooves, and bushings, jam nuts engaging projecting portions of bushings, and having air inlet perforations, and screw plugs engaging perforations of end walls of chambers.

APPARATUS FOR SCREENING CRUSHED ORES OR OTHER MATERIALS.—No. 697,353; W. McDermott, London, England.



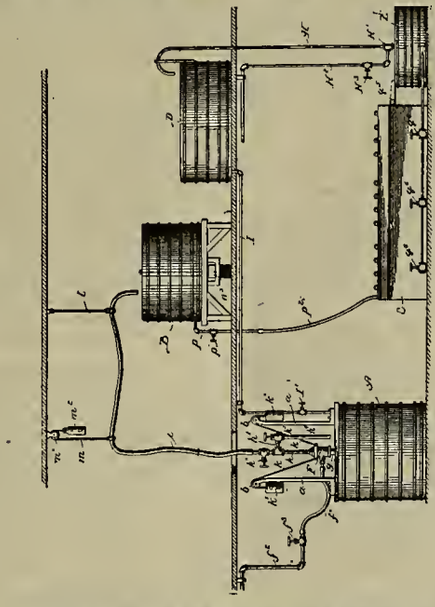
Main tank subdivided into reception and discharge chambers separated by screen, chamber below screen being closed against inflow of water except through screen, upper chamber being provided with restricted discharge passage on level with upper surface of screen and leading into water chamber, water supply for water chamber adapted to maintain head of water same as that in main tank so as to prevent interflow, discharge for water chamber, separate discharge in main tank for slimes and water which have passed through screen, means for feeding material under treatment into chamber above screen and for causing it to move thereon, float in water compartment, valve on slime discharge valve in main tank and connections between float and valve for automatically regulating discharge of slimes.

APPARATUS FOR MAKING IRON OR STEEL.—No. 697,213; E. Meininghaus, Dusseldorf, Germany.



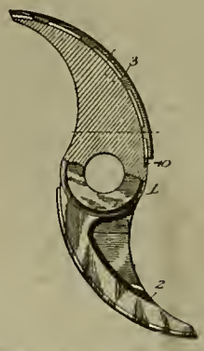
Producing wrought iron or steel direct from ores with crucible 16 having opening 25 in enlarged top, self-closing valve 26 upon opening, screw spindle 27 guiding valve, outlet pipe 28 near upper end of crucible for letting out slags and also molten metal from crucible, opening 29 at bottom of crucible, communicating with two channels 30 and 31, first one of which serving for opening or closing opening by plug 33 at end of spindle 32 passing through channel 30, other one, 31, serving for letting out fluid metal out of cruoible or for blowing air and gases into crucible.

APPARATUS FOR THE TREATMENT OF ORES.—No. 697,178; E. L. Sharpneck, Chicago, Ill.



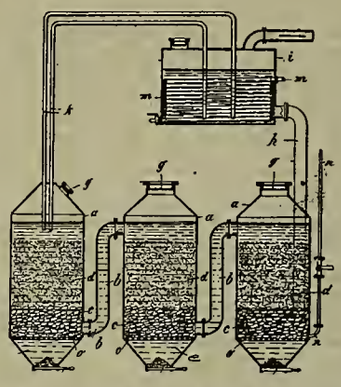
Leaching tank, filtering tank, valved conduit extending between tanks, valved branch pipe extending from conduit below valve in back to leaching tank and jet pump interposed in conduit between leaching tank and branch pipe, whereby liquid contents of leaching tank may be circulated through conduit and branch pipe or transferred through conduit to filtering tank.

CAM FOR STAMP MILLS.—No. 697,119; J. C. H. Vaught, Phillipsburg, Mont.



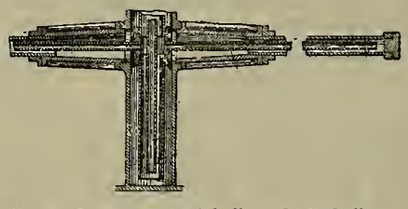
Cam provided at its engaging face with longitudinal groove having series of tapering recesses with undercut edges, and shoe detachably interlocked with cam and provided at inner face with rib having tapering enlargements engaging recesses.

PROCESS OF TREATING METALLIC SULPHIDES.—No. 697,138; A. Germot, Asnieres, and H. E. L. Fievet, Paris, France.



Process for conversion of sulphides into sulphates by subjecting them to action of ozonized air by holding them in suspension in liquid in presence of acid and blowing current of ozone into liquid.

ROASTING FURNACE.—No. 697,062; L. T. Wright, Keswick, Cal.



Series of floors, central hollow shaft, hollow arms carried thereon over respective floors, open bottom pipe inserted in shaft, second open bottom pipe in shaft into which first pipe discharges intermediate to first pipe and shaft, open ended pipes leading from intermediate pipe into hollow arms, and feed and exhaust pipes connected to first pipe and hollow shaft.

New East River Bridge at New York.

The second cable suspension bridge across East river from New York to Brooklyn, which is officially known as the Williamsburg Bridge, has the following structural dimensions:

Extreme length between terminals	7,200 feet.
Length between anchorages	2,800 feet.
Length of river span	1,600 feet.
Height of cables at top of tower above high water	333 feet.
Height of lowest part of bridge at center of main span, above high water	150 feet.
Width of bridge	118 feet.
Diameter of cables	19 inches.
Number of cables	4
Number of wires in each cable	7,696
Size of each wire, No 6, about $\frac{1}{16}$ of an inch diameter.	
Combined weight of cables	4,400 tons.
Combined strength of cables	90,000 tons.
Weight of main span	12,000 tons.
Cost of cables	$1,250,000
Cost of complete bridge, about	$15,000,000

The cables are being furnished by the John A. Roebling's Sons Co., who furnished the cables for the first East river suspension bridge.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

The Geological Survey reports of coal in Alaska that much investigation of the coal supply of the Yukon river has taken place. In addition to coal mines in British Northwest Territory, the Alaska Exp. Co. has started some developments about 60 miles above Circle City on the upper Yukon. The oldest mine is Drew's, opposite the mouth of Hess creek, where the workings are extensive, and the equipment includes steam hoisting apparatus, coal bunkers, etc. The Pioneer mine, below Hess creek and 30 miles above Rampart, is similarly equipped. Both mines produced considerable coal in 1900. Near Nulato, farther down the Yukon, the Blatchford and the Pickart mines produced some coal, and the Clemens Thein mine and the Williams mine, both between Nulato and Anvik, were small producers in 1900. The coals are chiefly lignites, with some bituminous coals, and, in a few localities, semi-anthracites. Developments so far have been entirely along waterways. The southeastern and the southwestern Alaska coal fields are on tide water along a coast affording good harbors open to navigation the entire year. They can be mined cheaply and can find a ready market for local steamboat and domestic use. No developments have been made of the higher grade coals of southern Alaska.

JUNEAU.

On Woewadski island, near Wrangel, the Olympia M. Co. of Seattle, Wash., are operating a 20-stamp mill on ore that yields about $7.50 per ton. P. D. Range is manager.

The Rodman Bay Co. is completing the work on its 150-stamp mill at Rodman hay on Baranoff island, near Sitka. The company has a mountain of low-grade ore.

T. H. Ellis, manager of the Detroit-Alaska G. M. Co., has started up the company's placer property at Windfall creek, near Juneau.

The Yellow Jacket Co., which owns four quartz claims at Windham hay, has completed the construction of 1½ mile of wagon road to the mine. This property will have the second stamp mill erected in that district, a 10-stamp mill being now en route for the property.

A mill test is being made on ore taken from the Humboldt and Occidental claims, near Skagway. The Humboldt property is being developed by a Skagway company, and 68 feet of tunnel has been driven on the property. The Occidental is being developed by a syndicate of ten claim owners, and a tunnel 120 feet long has been driven and numerous crosscuts run. Should these properties show a $1.50 value in the mill test, they can be worked at a profit, as they lay on the beach and water can be flumed 4 miles to supply them with power.

ARIZONA.

COCHISE COUNTY.

Supt. J. G. Hearne of the Black Diamond mine of Pearce says that the 200-ton smelter which the company is installing will be ready for operation by June, nearly all of the machinery for the smelter, power plant and tramways being on the ground now.

J. Brockman, Supt. of the Commonwealth mine at Pearce, states that the 17 miles of railroad which he is building from Pearce to Cochise will cost about $6000 per mile. The road will be provided with its own rolling stock and the entire equipment will be of the latest design. The road is being built to haul the supplies for the Commonwealth mine and the other mining camps in the neighborhood.

GILA COUNTY.

An important strike of sulphide ore has been made on the 300-foot level of the Rattler mine of the Manhattan property at Troy. The Rattler mine is opened by the Sisson incline shaft, with levels at 100, 200 and 300 feet in depth, all in good ore. This mine is expected to supply a large part of the ore for the smelter soon to be erected.

GRAHAM COUNTY.

The Shannon smelting plant at Clifton is practically completed and ready to be started up. The force at the mine has been increased to 125 men.

MARICOPA COUNTY.

The Garcia mine at Wickenburg is to be started up immediately. There is a 10-stamp mill on the mine and development work to the amount of 350 feet. The owner is a Canada company. J. B. Young is superintendent.

J. Burson, Supt. Arizona G. & C. Co., which is operating the Royal group of claims between Wickenburg and the Colorado river, says there is about 650 feet of development work done now and that it is proposed to put in a smelter this fall.

At the Granite Wash, near Wickenburg, Senator Dorsey and associates are prospecting to put in a 60-stamp mill. They have thirty-six claims and have 3000 feet of work done. The ores are free and concentrating. G. Treadwell is Supt.

A California company is working the Desert mine, near Wickenburg, and it is reported has struck a 3-foot vein of $50 gold ore. This company is said to be figuring on replacing with a new mill the old one that burned down several months ago.

MOHAVE COUNTY.

The mining claim near the Boundary Cone, owned by O. D. M. Gaddis, J. N. Cohenour and A. James, of Kingman, is reported honded at $15,000. The ledge is a large one, with streaks of very rich gold ore on one of the walls.

Gold Road camp, near Kingman, is to be named Acme. A postoffice is to be established there. The camp and surrounding mines have about 200 men at work at present. The number is increasing daily.

The C. O. D. Mines Co. is preparing to sink a new deep working shaft on the C. O. D. mine, at Boundary Cone. The old shaft is too small and, it is estimated, would cost as much to put in shape as to sink a new and big working shaft. A flow of water encountered in the 200 level assures enough water to supply the mill, heretofore running on short time on account of lack of water.

SANTA CRUZ COUNTY.

F. Powers is reported to have sold a three-fourths' interest in the World's Fair silver mine near Patagonia for $500,000, to T. Brockman, D. M. Harringer and Senator Penrose and his brother, who are owners in the Commonwealth mine at Pearce.

YAVAPAI COUNTY.

M. S. Taft and V. A. Salinger of the Victor M. Co., near Prescott, on Lynx creek, propose to install a 3-stamp mill on the Victor mine.

The Iron Queen mine at Bighug has several hundred feet of development work, and the G. A. Treadwell M. Co. operating it is figuring on putting a smelter of 100 tons daily capacity on the property, the smelter to be in operation in a few months. Oil will be used as fuel.

Supt. Henderson of the Rochester M. Co., operating at Placeritas, says the company will soon put in hoisting works, sink 300 feet and erect a 10-stamp mill.

CALIFORNIA.

AMADOR COUNTY.

W. J. McGee, trustee for the Bay State M. Co., has given the Rhetta M. Co. of Stockton, W. W. Worthing president, a new bond to purchase the Bay State mine, near Jackson. The sum of $6200 was paid under the old hond and the company has spent over $75,000 on the mine. The new bond provides for a payment of $1100 on May 1st, and all over $3 50 per ton realized from the mine is also to be paid on account.

The Sargent G. M. Co. has been incorporated in San Francisco by W. H. Roden, S. Ducas, W. B. Coffee, J. H. Dawson and F. Kirchhoffer, capital $100,000, to operate the Sargent mine on the Mokelumne river, south of Jackson. W. R. Thomas of Sutter Creek will be manager.

The Amador & Calaveras Red. & M. Co. has been incorporated at Jackson, capital $200,000. The directors are T. A. Nelson, E. H. Cary, J. Marshall, N. W. Mahaffey of Jackson and F. H. Cordway of Lodi.

At the Plymouth Rock mine, at Plymouth, J. H. Durst Supt., the tunnel is now in over 400 feet and is expected in another 150 feet to reach the ledge.

On the Creek mine at Plymouth, believed to be the north extension of the vein of the Pacific and Empire mines, W. Axford and J. Reeves of Plymouth have started a vertical 4x6 shaft, which is expected to strike the ledge at 160 to 170 feet.

On the Illinois quartz mine at Plymouth, owned by T. Boyson of Sutter Creek, a ledge of quartz containing rich arsenical sulphurets has recently been discovered by Supt. Storms of the Baliol mine at Jackson, who was making an examination of the ground.

The Hercules quartz mine, near Plymouth, has been sold by W. F. Detert of Jackson and M. Brinn of Sutter Creek to C. H. Shields of Plymouth for $5000. It appears that the Mexicans worked the surface croppings many years ago and took out a considerable amount of gold. Development work has been started by the new owner.

BUTTE COUNTY.

It is reported that Col. F. McLaughlin has become interested in the Big Bend tunnel proposition, owned by Dr. R. V. Pierce of Buffalo, N. Y. The Big Bend tunnel affords an opportunity for the development of electric power on a large scale. The tunnel was originally constructed for mining, and through it the waters of the North Fork of Feather river may be diverted and the bed of that stream rendered dry 13 miles. The tunnel is 2½ miles long, 16 feet wide and 12 feet high. It is estimated that the river carries at its low stage 40,000 miners' inches of water. The available fall from the point where the water leaves the tunnel back to the river is 300 feet. It is estimated that more than 25,000 H. P. can be developed.

CALAVERAS COUNTY.

A rich strike has been made in the Lightner mine at Angels. A pocket found shows ore assaying from $25,000 to $30,000 a ton. The ledge is 16 feet wide in one place and 3 feet in another.

The Buffalo Blue Gravel mine, near Mokelumne Hill, has been unwatered, cleaned out and retimbered, a suitable hoist and a 3-stamp mill erected, and work in the mine commenced by the owner, C. A. Werle. The shaft is 200 feet down to the bottom of the channel, and about 900 feet of drifts have been run. The channel is about 120 feet wide, with about 10 feet of gravel, which averages about $1.50 to the carload. The mill is built near the collar of the shaft, saving rehandling of the gravel, which is dumped directly from the bucket upon the grizzly. The mill is kept in operation about twelve or fourteen hours daily, crushing about fifty tons of gravel. Ten inches of water under 285 feet head run the hoist and mill.

Operations have been resumed at the Giuffra quartz mine at Mokelumne Hill by Los Angeles people, with Col. Rohinson as manager. A hoist is being erected and as soon as completed sinking on the vein will commence. There is a mill on the property.

The Utica Co., at Angels, propose to enlarge the electric plant situated near Murphys, the preliminary work having been commenced. A ditch will be dug for another pipe line. The work now in contemplation will take several months. The increased demand for power all along the line throughout the mining sections has prompted this decision for improvements.

At the Horn mine, in Pioneer district, near Jackson, G. W. Horn Supt., 160 feet is being run to reach the vein opened in the shaft. It will open up the ledge over 100 feet below the bottom of the shaft.

P. Bernasconi of Fourth Crossing, near San Andreas, is doing prospecting work on a big ledge and has commenced a perpendicular shaft which is to cut the ledge at about 100 feet depth.

At the Del Monte mine, near Glencoe, the machinery for the air compressor is on the ground and is being put in position.

EL DORADO COUNTY.

The 10-stamp mill at the Montezuma mine, at Nashville, is said to he crushing some rich rock from the 300-foot level of the mine. It is reported the company contemplates the erection of a new hoist.

INYO COUNTY.

The Bishop Light & Power Co. has been incorporated at Bishop by J. L. Davis, A. S. Kilpatrick, G. A. Clarke, A. T. Dickey and S. E. Vermilyea, who are the directors of the company. The capital is $20,000, and the company will construct an electric power plant.

Leidy Bros. & Vanfleet have bought the Storey mill, near Laws, and will run it on ore from their No Sabe mine.

KERN COUNTY.

The Dean & Jones M. Co. at Slate-range, near Randsburg, is crushing about 1300 tons of ore per month. They regularly employ about fifty-five men.——The Arondo M. Co., of which Mr. Dean is president, is operating in the Argus range. At present a road is being built, grading for buildings and preparation made for the putting in of a plant. This property is a low-grade cyaniding proposition, and the process will consist of dry crushing and cyanide treatment. The ore is very soft. Enough development work has been done to warrant the construction of a 100-ton plant.

NEVADA COUNTY.

The Gold Crown M. Co. has bought the mill of the Live Oak Drift mine at Forest Hill, in Placer county, and will install it at the Gold Crown mine at Omega.

Supt. C. M. Root of the New Independence mine on Wolf creek, above Moore's Flat, has taken in new machinery and started up work on a considerable scale.

The Yuba-Monarch M. Co., at French Corral, has let a contract to G. Warner and C. Alpers to run a tunnel on the mine.

The Red Cross mine, at Omega, has been sold to the Western Exploration Co. hy J. A. Brent. Besides the Red Cross, Brent also sells the Green Pine, Forest, Omaha and Marchands quartz claims in that vicinity. At present the mine is under lease to a party of miners, who are taking out some good ore and keeping the mill running.

The Champion and Spanish M. Cos. of Nevada City have elected the same board of directors for both companies, as follows: C. J. Schuster, H. Mohr, J. Fetz, I. Rosenthal, J. Ott, F. Zeitler and M. Nonnerman, all of San Francisco.

PLACER COUNTY.

Thos. Brown has bought the old Paragon mine at Bath from D. Wheeler and the Breece estate.

R. Jones, Supt. of the Canada Hill gravel mine, near Westville, says that his present force of twelve men would soon be largely increased.

PLUMAS COUNTY.

The hydraulic mine on Hungarian hill, known as the Plumas Imperial, has been leased hy C. Hazzard to San Francisco parties, with M. A. Delano Supt.

SAN BERNARDINO COUNTY.

A ledge of antimony ore has heen discovered near Randsburg by J. T. Reed, S. S. Thomas, E. Swartout and J. S. Lord of San Bernardino. Samples of the ore assayed showed 49% antimony. There is said to be a 12-foot ledge of it.

SHASTA COUNTY.

The Afterthought mine at Buckeye has been bonded by Z. F. Bullock to J. H. Roberts of Redding at $3500. The bondholder agrees to pay $1750 on November 11, 1902, and an equal amount on September 11, 1903. Fifteen per cent of all ores extracted must be paid to Bullock on the purchase price.

A. Leiter of Igo reports $1200 gold was taken out of a 60-foot square piece of placer ground at Horsetown. The ground is worked in a primitive way by stripping it down to within about 4 feet of bedrock and then shoveling the 4 feet of pay gravel on top of the bedrock into sluice boxes. A Mr. Heinz, representing a Salt Lake, Utah, company, has bought 80 acres of ground at Horsetown, and during the summer will build a dredger on the ground. He expects to operate it with electric power.

The Mountain Copper Co. of Keswick uses 1050 H. P. of transmitted electric power to operate the smelting plant and mine.

E. Holden has honded four asbestos claims west of Sims to parties at $4000. The ledge of asbestos on the claims is said to vary from 18 inches to 3½ feet in width.

The Excelsior and Most Anything quartz mines in Flat Creek mining district, near Keswick, belonging to O. La Plant and H. E. Bedford of Keswick, have been bonded at $6000 to J. R. B. Coon and D. C. Mitchell of San Francisco. The bond calls for continuous development.

SIERRA COUNTY.

The New Independence M. Co. is operating under bond three gold quartz claims on Wolf creek, near Alleghaney. R. M. Donne is president, F. E. Harmon secretary and treasurer, C. M. Root superintendent and R. J. Simmons managing director. A shaft is now down 220 feet on the vein. The installing of a new hoisting plant is under way, in charge of G. A. Nihell of Nevada City. Improved devices for gold saving will be added to the mill now on the mine. The company expects to have the mine and mill fully equipped and ready to start within the next sixty days. It has an abundance of timber on the property and a ditch 4 miles long with a never-failing free water supply, which is so situated that it will give 1000 feet fall.

SISKIYOU COUNTY.

The Pine Grove placer mine, now being worked hy M. J. Whitney & Co., with an elevator, near Oak Bar, has been sunk to bedrock and has struck gold realizing as much as $4 to a pan of dirt.

The Portland Co., operating the old Len Miller mine and several other properties on Indian creek, near Fort Jones, under the management of Mr. Scott, are now running the 10-stamp mill and employing about thirty men.

R. M. Bennett and G. F. Raynolds, who have been inspecting their mining properties at Hornbrook, state that they have decided to build a 10-stamp quartz mill at their mine, which has received extensive development under the superintendency of Mr. Mattern.

Mining on the lower Klamath is extensively carried on this season, as there is an abundance of water to keep the giants well supplied. The Van Brunt, Minnetta B., Siskiyou and other claims at Happy Camp are in full blast and good cleanups are anticipated.

The Blue Ledge mine in the Jo creek country, north of Happy Camp, on the western slope of Siskiyou mountain, will be worked considerably as soon as the snow is off, and the prospects are favorable for the development of a rich and extensive mine in both gold and copper.

TRINITY COUNTY.

(Special Correspondence).—At the Dorleska mine at Abrams twenty men have been employed throughout the winter under Supt. M. H. MacIlwaine. The vertical shaft has been sunk to a depth of 200 feet, and a crosscut started west for the vein. The contract for running 500 feet of tunnel No. 2, given last September to Mortimer & Carter, has been completed, and a second contract for 500 feet additional given to the same parties, is now under way. The tunnel is to connect with the third level at the shaft, and will be about 1300 feet in length, 400 feet of crosscut and the remainder drift on the vein. The new mill will start up as soon as horses can be got in to haul ore. Last season, from ore extracted in development work, over $35,000 was produced in a small prospecting mill. The company has a sawmill and store at the mine. The Union Con. G. M. Co. of Los Angeles operates the mine. H. Z. Osborne is president and general manager.

I. W. Zent of Deadwood has $500 as the result of two weeks' run made by himself and M. G. Carter in an arrastra on ore from locations between the Brown Bear and Lappin mines. They have a good shoot of high-grade rock ready to stope out.

The Brown Bear mine, at Deadwood, is running a full force of men. By May 1 the power plant will be started and air drills will resume pushing the crosscuts ahead.——At the Lappin, recently bonded by Eastern people for $110,000, a triple-compartment shaft is being sunk from the tunnel and is now down 135 feet.

Mr. Duval, who owns a quartz mine near Carrville, will erect a 5-stamp mill this spring. The mill will be run by water power.

TUOLUMNE COUNTY.

The sale of the Hunter or New Era mine near Carters, owned by C. A. Holland, W. T. Carter, A. Hines and Mrs. B. Gallagher, is reported to New York people. The mine has a 10-stamp mill with a ditch and water rights. A very rich vein has been struck since the papers were signed and men are at work taking out all ore possible before the mine actually changes hands.

The Hardtack mine, near Carters, owned by McAvoy, White & Sears, has been bonded by C. A. Holland and associates. It is the pian, so it is reported, to consolidate the Hardtack and New Era mines and use one mill with tramway for both properties.

A new 10-stamp mill will be installed at the Sunnyside mine, near Carters. C. G. Smith is Supt.

J. Daly has sold to Baker Bros. of Carters his half interest in the Galway and Old Glory mines, a quarter interest in the Little Johnnie and a third interest in the Never Sweat and River View mines, situated near Carters.

Baker Bros. and J. Daley bonded the Sunnyside mine, near Carters, to C. A. Smith and Los Angeles people. About $6000 has been expended on this mine running a 300-foot crosscut. Improvements will be made, including a plant operated by electricity.

The Black Oak mine, near Soulshyville, is putting in a new hoist.

Supt. J. L. Partz of the Goldwin mine, near Columbia, says he is now taking out rich ore on the 600-foot level. He is looking into the matter of electricity for power. The 10-stamp mill is running part time.

The Piedmont G. M. Co. has sold to H. Brunner of San Francisco the Sweeny quartz mine, situated at Quartz Mountain.

COLORADO.

CLEAR CREEK COUNTY.

The preliminary work on the Conqueror group, near Empire, for development contemplated by the new owners is progressing. A large compressor is on the ground. The mill owned by the company will be refitted throughout and additional machinery installed. M. Brown is manager.

The Dillingham-Chamberlain sampler at Idaho Springs will double its capacity by an increase in the storage and ore bins, which will enable it to handle about 100 tons a day. The extension is made necessary by the closing down of the other samplers at Idaho Springs.

H. A. Ridel of Colorado Springs has bought of J. I. Coddington the Wm. Lewis group of claims, near Idaho Springs, for $20,000. A company is to be organized and a tunnel driven to develop the group.

The Ninety-four Tunnel Co., at Yankee, it is stated, will increase the capacity of its dry process mill to forty tons by putting in heavier machinery.

The Cumberland Co., at Yankee, it is stated, will add several stamps to their mill soon.

On the Ruby mine, near Georgetown, some improvements are being made. The adit has been enlarged and retimbered. Manager Burgess has erected an office building. Surveys have been made for a water power owned by the company, and plans for the installation of a power plant are being made.

F. Evans of Denver has made a strike in the Stag group of claims, near Idaho Springs, at a depth of 150 feet. Over 3 feet of pay ore has been opened, 12 inches of it running 68% of lead, in addition to the gold and silver. The balance runs $15 a ton and can be concentrated.

CUSTER COUNTY.

The Florence M., M., S. & R. Co. has bought of T. E. Blunt the Combination, Nebraska and Summit claims near Silver Cliff. Arrangements are to be made at once to reopen them and ship to Florence for treatment.

EL PASO COUNTY.

E. Weighley of Chicago, Ill., an owner in the Cripple Creek-Dean mill, states that he is arranging for the reopening of the cyanide plant in May. The capacity of the mill will be increased from 60 to 100 tons a day.

GILPIN COUNTY.

A half interest in the Old Town mine at Russell has been bought by F. E. Himrod of New York City, at a price supposed to be not less than $50,000. G. K. Kimball retains the remaining half interest.

Boston people are reported to have bought the Rocky Mountain mill at Black Hawk. The new owners, it is stated, will make changes at the concentrator and may increase its capacity.

A new company is being formed at Idaho Springs to work a group of claims at Russell. The promoters are G. K. Kimball, Jr., S. B. Bontems and M. W. Tanner. They have four claims adjoining the Old Town mine and have already put on a good plant of machinery and begun working. S. B. Bontems is secretary and treasurer of the company, with office in Denver.

The Bant lode at Black Hawk has been sold to W. A. Garrett and J. H. Johnson of Holdrege, Neb. Garrett & Johnson are interested in the International M. Co., operating the P. K. mine in Silver gulch, also near Black Hawk, and represent a company of Nebraska people. A shaft building and hoisting plant sufficient for a depth of 1000 feet have already been contracted for, and active developments are being planned.

The Victoria mine at Gilpin is being operated by W. C. Stevens & Co., with P. Peterson as manager. The mill ores will be crushed at the Peterson mill, which has been started up. The smelting ores will be shipped. The mill ore shows by assays a value of about three ounces to the cord and a test sample of smelting ore ran $50 to the ton. There is about 10 inches of smelting ore on the hanging wall and another streak about 6 inches wide on the foot wall. The entire width of pay ore is about 6 feet. The Peterson mill contains fifteen slow drop stamps with amalgamating plates and Gilpin County bumping tables. It will also be run as a custom mill.

The Charter Oak mine on Quartz hill, near Russell, has been started up by E. W. Davies for Eastern people. Mr. Davies will have charge and W. H. Quintrall will be foreman. The shaft is now down 500 feet and it is the intention to sink it from 200 to 300 feet deeper at once. The machinery will be overhauled.

GUNNISON COUNTY.

The Augusta Co. of Denver is planning to remodel the old mill at its mine near Gunnison, and the wagon road will be extended to the mouth of the new tunnel; a tram will be connected with the mill from this point, and before the season is closed the mill will be treating the low-grade ores both from the mine and the new tunnel.

HINSDALE COUNTY.

It is said that the Golden Fleece mill at Lake City will be overhauled at once and that its capacity will be increased to 100 tons. A new compressor of about fifteen drill power will be installed at the mine.

LAKE COUNTY.

Mr. Dunbar, representing the Eastern interest in the Home Extension M. Co., at Leadville, says the Boston G., C. & S. Co. has about completed arrangements to remodel the old plant and resume operations. The company will issue bonds to provide sufficient working capital to repair the plant and start it up.

MINERAL COUNTY.

The Home M. Co., which has a lease on the Bachelor mine at Creede, has started up work, using the Bachelor power plant. The Bachelor will be developed at a depth further down than any work heretofore done at Creede.

The Corsair M. Co. at Creede has decided to sink a shaft and open up the ground below its tunnel level, and will erect a plant of machinery on the ground for that purpose. C. S. Thompson has been appointed Supt.

PUEBLO COUNTY.

Engineer E. W. Hathaway, who has in charge the surveying and preliminary work for the new zinc smelter at Pueblo, has let the contract for the earthwork to be done to T. Corrigan of Pueblo at $10,500. There were five bids received, ranging in price upward to $16,500. There are 62,000 yards of earth to be excavated.

SAN JUAN COUNTY.

In the Spotted Pup of the North Star group of mines at Silverton a 4-foot streak of high-grade gray copper ore has been opened.

The Quartz M. Co. has resumed operations on the Washington group, near Silverton, under Supt. A. Kunkle. The width of the vein at the bottom of the shaft is claimed to be 118 feet, with values in gold and silver from $7 to $15 per ton.

The Sultana M. & M. Co., capital $1,000,000, has been incorporated, with J. M. Conway, of Silverton, at the head. It owns the Grand Turk group of claims on Sultan mountain, near Silverton. The Sultana Co. is composed principally of Peoria, Illinois, people.

The Western States G. M. Co., of Tennessee people, has been incorporated to operate Deer Park mines, including the Montana group, at Silverton. A. H. Mundee, of Silverton, is manager, and is to let a 100-foot contract on the proposed tunnel into the Montana vein. He says that in all probability air drills will be put in before fall.

J. B. Warner, manager of the Silver Ledge mine at Silverton, says the company plans the erection of a 100-ton concentrating mill and deep development work on the Silver Ledge vein. He is letting contracts for the preliminary work for the mill.

The Sunnyside mill at Eureka has started up with water power and the engines used during the winter months have been shut down. Six months of the year the Animas river furnishes power for the present capacity of the mill. Preparations are being made for adding twenty stamps to the mill.

SAN MIGUEL COUNTY.

At the Japan mine, near Telluride, work will commence on reconstruction of buildings that were destroyed by the explosion and fire a few months ago. A new compressor house will be built and the boarding and bunk houses will also be enlarged. About twenty men are employed now.

The Ophir Con. Co. has commenced excavating for a 30-stamp addition to the mill at Ophir Loop. The present plant has twenty stamps. The present mill was erected less than a year ago. About forty men are employed and the shipment averages a car of concentrates a day. The tunnel on the Silver Bell will be further advanced by the immediate installation of a compressor plant and power drills.

Tomboy G. M. Co., Ltd., has bonded the Columbia-Menona properties and is overhauling the works. The company has held a lease on part of the Columbia mill for the treatment of ore from the Argentine, and will now have a two years' option on the mining property.

OURAY COUNTY.

The electric power plant of the Revenue Tunnel M. Co. at Ouray, which has been under construction since early last fall, is now completed, with the machinery placed in position. It is hoped to get the new plant in operation by May 1st. It will furnish light and power for the mills and mine of the company, and in addition to other plants nearer the mine, which are now driven by water power from Canyon creek.

TELLER COUNTY.

The largest consolidation yet made in the Cripple Creek district has been announced by the Woods Investment Co. It embraces all the properties of eight large mining companies along the line of the United Mines tunnel, which is to be 9462 feet long. A new company is being incorporated in Colorado, with $5,000,000 capital, part of which is to be issued in payment for the properties taken in by the merger. The consolidating companies are the Consolidated Mines, New Zealand, Damon, Columbine-Victor, Battle Mountain Con., Columbine-Gold, Bonanza Queen and the United Mines Transportation companies. The holdings of the company embrace 375 acres. The Portland Co., with 200 acres, is the next largest holder of Cripple Creek property.

The El Paso Con. G. M. Co., at Cripple Creek, has settlements on 500 tons of the 600 tons shipped from the mine during March. The returns are considered high and indicate an average value of $52.40 a ton. This is within 30 cents a ton of the average shipments sent out by this property during 1901. The gross production of the El Paso for March will be close to $32,000—all taken out in doing dead work, driving drifts and opening levels. The mine is making about 100 tons of ore on every 200 tons of rock hoisted to the surface.

The Buckhorn property at Cripple Creek has been leased to a leasing company, operations to be started soon. The showing on the Buckhorn consists of very narrow seams, from which some very rich ore has been obtained.

The Anaconda M. Co., at Cripple Creek, has decided to cease operations on company account and lease the remaining portion of the property. The action is due to the great amount of work that was performed last year by the various lessees, who mined something like $200,000 worth of ore, which netted the company better than $50,000 in royalties. The company owns a total of 93 120 acres of ground on Gold hill, and at the present time there are thirty sets of lessees operating various blocks of ground.

A. H. Heller, who bought the dump of the Ironclad mine at Cripple Creek, is removing it to the Arequa mill, which he has leased. As high as 75 tons a day is being taken and is found to average over $5 to the ton.

The Elkton Con. M. Co. and the El Paso Con. M. Co. have contracted with the United States Reduction Co. to send their entire output for three years to that concern.

James F. Burns, president of the Portland M. Co., at Victor, says regarding the condition of the Cripple Creek mining industry as follows:

"I consider that with a judicial system of development, Stratton's Independence will again become a great producer and still be ranked among the great mines of the district. Even though the bonanza ore that was shown nearer the surface may not continue, the bodies will be larger. I have always maintained that the Cripple Creek district would finally be a low-grade proposition with values ranging in the neighborhood of from $25 to $30 per ton, but as the values decrease the veins become wider and larger.

"With fair and just treatment charges by the smelters and mills, in connection with the low rates of transportation made possible by the Short Line railroad, Cripple Creek's output would be $40,000,000 per year instead of $20,000,000, and would have a boom like that of 1895, but on a larger scale.

"The helpless mine owner is in the grasp of the smelter and mill trusts. The mill trust, with a capitalization of $10,000,000 and $3,000,000 of bonds, paid $250,000 in dividends in two and one-half months, and it is claimed that they made a profit of $120,000 during the month of March. If the stocks and bonds of this combination were sold at market quotations to-day, they would bring about $7,400,000 on an invested capital of less than $1,800,000.

"The mining business is not 'in it' with them. The business of ore treatment is evidently much more profitable than the business of ore production. This trust will not make contracts with mine owners for ore f. o. b. at mill, but demands that they be f. o. b. at mine, which gives the mills all of the advantage of reduced freight rates without a corresponding reduction to the mine owner in the treatment charge. Thus you see the combination absorbs the benefit which was intended for the mine owner. They give us the flimsy excuse that the smelter trust will not allow them to quote prices f. o. b. mine, thereby showing that the mill and smelter trusts are either the same or have a mutual understanding. As a result of the rate war now on between the two railroads, the rate on all ore is $1 per ton to Colorado City, but the mill trust compels the mine owner to pay the schedule rate, thereby making a profit of from 25 cents to $1.50 per ton.

"The latest developments are that the smelter and mill trusts are forcing all samplers in the district to form a sampling combine, which if not a part and parcel of the parent combination will be a feeder to the same. Those that refuse to join the trust will be confronted by the ultimatum of the smelter and mill combinations that their ore will not be received, which will prevent the independent sampler from assisting the fettered mine owner.

"It is time that the mine owners wake up and get together to the end that they own or control plants for the treatment of their own ore. They have a railroad and with their own mills they would be out of reach of the trust and would soon sound its death knell in Colorado.

"If some of the largest producers, such as the Strong, Gold King, Ajax, Anchoria-Leland, Mary McKinney, Isabella, Gold Coin, Independence and many others, would co-operate in building a modern combination mill as nearly automatic as possible, with a capacity of something like 600 tons, the cost of which in round numbers would be about $500,000,

they could be absolutely independent. Running at its full capacity it would handle 18,000 tons per month at as small a cost as the combination could handle the same. Making a liberal estimate and putting the cost of treatment at $5 per ton and transportation at $1, we would make a saving of $2 50 per ton on one-ounce ore, based on present rates of treatment. But supposing there would be a saving of only $1.50 per ton, the size mill above mentioned would make a monthly saving of $27,000 or $324,000 per year. This would be 60% on tbe investment, and in less than two years the plant would pay for itself. In addition to all this, there would be an elimination of all the little leakages that continually manifest themselves in custom mills."

W. S. Stratton is about to sink a deep shaft on the Reform claim on Bull hill at Cripple Creek. The shaft is down 300 feet and will be driven to 1000 feet. The mine has not been worked for five or six years.

IDAHO.

ADA COUNTY.

An Eastern company has bought the Friday mine, near Pearl. This mine was worked to some depth a few years ago. It will be reopened immediately.

The Delhi 10-stamp mill, near Boise, has commenced crushing. This mine and mill are owned by W. A. Magee of Pittsburg, Pa. The ore is said to be milling $12 per ton in gold. The ledge is a very large one and opened up to the depth of 400 feet.

The Overlook group in Neal district, consisting of twenty-one claims, owned by G. M. Parsons, E. W. Johnson and J. W. Murphy of Boise, and people in Chicago, Ill., and Madison, Wis., will be developed on a large scale the coming summer. The company is to commence the erection of a mill with a capacity of sixty tons per day immediately.

BOISE COUNTY.

On Willow creek, near Idaho City, several mine owners have been working during the winter at developing several small ledges, which are from a few inches to 2 feet in width. The vein owned by C. Small averages 2 feet in width of ore that mills from $40 to $100 per ton in free gold. The claim owned by J. Constable has a vein that is only 5 inches to 1 foot wide, but mills from $100 to $150 per ton in free gold.

BOX ELDER COUNTY.

Manager P. W. Madsen, of the Century mine at Park Valley, reports that the main shaft is now down 100 feet on the vein, and the entire distance shows an average of $14 in gold to the ton. A force of men are at work clearing the ditches and opening the springs that supply the mill.

IDAHO COUNTY.

C. Kincaid of Pierce City reports a rich strike of free-milling gold ore as having been made in the Pioneer, near Pearce. The strike was made in the 132-foot level. The vein is 28 inches wide and assays range from $35 upward a ton. The Pioneer is principally owned by L. Grant of Detroit, Mich.

J. Dahl is preparing to operate on his Big Creek placers near Dixie. He has found as high as $15 to the pan on bedrock in his diggings, and will this year attempt to determine the extent of the deposits. The gold is all coarse, the nuggets usually being from the size of a pea to as large as a hazel nut.

The 10-stamp mill for the Crackerjack mine at Buffalo Hump is being teamed in. The plant consists of a 35 H. P. engine and boiler, a saw mill and the stamp mill proper. The saw mill will be set up first to saw out the timbers for the mill house. The stamp mill is not expected to be in operation before late summer or fall.

It is reported that the Buffalo Hump syndicate mill at Buffalo Hump will be enlarged this year, making it a twenty-stamp instead of ten, as at present. The Jumbo also is to be enlarged from its present size of four stamps up to eight or ten. It has produced from $1000 to $1300 per stamp per month all winter, and the mine is claimed to have ore in sight to justify the increase in mill capacity. A wire tramway was recently put in from the tunnel mouth down to the mill, 300 feet, to replace the old gravity chute which was about worn out. It is said to work finely.

On the Hogan Bros.' Buffalo Queen property at Crooked river, near Buffalo Hump, the 10-stamp mill is on the ground and the mill house is under construction. It is the intention to double the capacity of the mill as soon as possible—this year, probably—and the framing is being done with that in view. The company has a water power sufficient for a 40-stamp mill.

The discovery of a lode on the head of Botha creek which gives an average value of $120 a ton is reported from Thunder mountain.

KOOTENAI COUNTY.

The Idaho-Continental M. Co., operating the Continental group, near Port Hill, is planning to secure a railway into the mines at once. A. Klockmann, managing director, of Duluth, Minn., states the Great Northern may build a line to the mine from Port Hill, otherwise there is a strong probability that a railroad company will be formed by the stockholders of the Idaho-Continental Co.

SHOSHONE COUNTY.

The Standard & Hecla silver-lead mines in the Cœur d'Alenes are to be consolidated to reduce expenses. The Standard is capitalized at $2,000,000 and the Hecla at $1,000,000. Practically the same men own both mines. It is proposed to issue $3,000,000 in capital stock for the new corporation, which will be known as the Standard-Hecla Con. Co.

WASHINGTON COUNTY.

A rich strike is reported made on Snake river by J. Smith, a prospector and miner, who says that for some months past he and his partners have been working on a group of twelve claims 22 miles from Baker City, Or., on the Snake river, and have developed some very rich ore.

C. W. Luck of Weiser and W. H. Tibbals of Salt Lake City, Utah, have bonded the Sturgil Bar placers, near Weiser, at $200,000, the first payment of $50,000 to be made in three months. Luck & Tibbals claim to be acting for an Engli h company.

MICHIGAN.

HOUGHTON COUNTY.

An average of 750 tons of rock daily is being treated at the Baltic mill, at Houghton. A third head at the Baltic is expected to go into operation shortly, while two heads of the Champion mill should be in operation around midsummer and four heads should be in operation in either mill by fall, making eight in commission before the winter sets in. These eight heads will handle an average of 3600 tons of rock daily, allowing 450 tons to each head. It is claimed that Baltic and Champion rock runs thirty-six pounds of copper ingot to the ton of ore treated. It is figured that copper can be produced at 7 cents per pound.

MONTANA.

BEAVERHEAD COUNTY.

J. Innes, who has been working on his mines at Bannack all winter, it is reported, has struck a fine body of quartz carrying gold and copper.

CHOTEAU COUNTY.

J. Smith has located the Surprise and Rock of Ages claims on a wide lead of low-grade ore near Highwood. The vein assays $4.05 per ton and the lead is traceable for several hundred yards on the surface.

FERGUS COUNTY.

Spring work has commenced at the sapphire mines of the New Mines Sapphire Syndicate at Yogo, under J. Stites, the foreman. A large amount of development work is projected this year in addition to the mining of the gems. P. Ramond is bookkeeper in the company's office and C. Gadson is superintendent.

E. J. Morison of Billings has bonded a group of five claims at Kendall from F. L. Stephens, Ruth Stephens and Marion Walters at $20,000. Not much work has been done on the property, but the surface showing is of values from $1 to $4.50 per ton.

A 5-stamp mill will soon be in operation on the property owned by Lyons, Oliphant & Helsing, near North Moccasin, the work of placing the plant having already been commenced. The ore is free milling and runs from $3.50 to $5 per ton.

JEFFERSON COUNTY.

Recent development in the King Solomon mine, near Clancy, has opened up a large body of high-grade ore at the 150-foot level. The pay shoot is 180 feet long and 5 feet in width, assaying from $25 upward per ton. Mr. Moreland, the present owner, contemplates the erection of a complete concentrating plant, including a mill for crushing the ore.

LEWIS AND CLARKE COUNTY.

The Montana M. Co. has begun the development of the Noya claim, owned by J. Shafer, in the Park district, near Helena. The Noya is an undeveloped claim, with a large surface showing of gold-bearing ore. Work is being done on a shaft with a horse whim, and later a steam hoist will be erected.

MADISON COUNTY.

H. I. Wilson and T. M. Hodgens of Butte have begun work on the Elgin mine, near Rochester. They are now negotiating for machinery to be used on the property. The ore of the Elgin is gold-bearing. The development work is in charge of S. C. McClure.

The Conrey M. Co. has decided to erect a large machine shop at Ruby. It will be fitted with a steam hammer, turning lathes, etc. It is stated that the dredger boat belonging to the company will be started up immediately. The machinery of this dredger has been thoroughly overhauled and remodeled. The new dredger will be completed and ready for operation by the first of May.

G. D. B. Turner, formerly manager of the Red Bluff M. Co., has started work on the Pole creek placer mines belonging to A. W. Tanner of Norris. Mr. Turner has bonded these mines. Besides gold, they yield rubies and garnets of sufficient values to defray the expenses of working. To work them to the best advantage a large ditch has to be brought to the mines.

The January Dell M. Co., recently organized in Butte, with capital of $200,000, owns a group of six claims near Twin Bridges, and the Jenny Dell and the October claims, near Walkerville. It is understood that the company intends to sink the shaft of the Jenny Dell 125 feet, which will give a total depth of 300 feet.

One of the richest strikes of mineral ever reported in this State is stated to have been made in the Kearsarge mine at Summit, near Virginia City. From a 2-inch streak the vein has widened to more than a foot, and the ore in it is nearly all gold. R. B. Turner is the general manager of the Kearsarge and Kennett, having been appointed recently.

PARK COUNTY.

A. C. Jardine, Supt. of the Bear Gulch M. & M. Co. at Livingston, says that there will be a 40-stamp mill installed at the mine this summer. The work on the sawmill will be commenced at once.

SILVER BOW COUNTY.

A. Leathers and associates are developing a claim at Butte that, it is claimed, has an excellent showing of mineral. The shaft is down 100 feet and in ore. Nearer the surface a shoot of ore was struck that is rich in gold.

NEVADA.

ELKO COUNTY.

At the Lucky Girl quartz mine on Bull Run mountain, 45 miles north of Tuscarora, ground is being broken for a 75-ton cyanide plant, which will be erected immediately. The 20-stamp mill is kept running.——The Bull Run mine, operated by a local company, has a 10-stamp mill and cyanide plant running.

LINCOLN COUNTY.

A half interest in the Blossom and Coyote mining claims, near Searchlight, has been bonded at $25,000 to the Southern Nevada M. Co. of New York. Terms were $5000 cash and four monthly payments of $5000 each. This gives the company the whole of both claims.

WHITE PINE COUNTY.

The Monitor mine, near Ely, owned by Governor Sadler, S. Hilp, A Jackson, A. E. Cheney and T. Wren, is reported sold to the New York & Nevada C. Co.

NEW MEXICO.

GRANT COUNTY.

The Lena concentrator at Lordsburg has been started up. Owing to the lack of facilities for transporting ore it is not being run to its full capacity, but all the different mills and tables have been tried and all work satisfactory. The product is a fine quality of concentrates and assays of the tailings show that a close saving is made.

The mill of the Helen M. Co., at Graham, is treating sixty tons of ore daily. A force of seventy-five men are at work in the mill and mine. At a depth of 855 feet a 6½-foot vein of $55 ore has been uncovered.

The property formerly owned by A. A. Hamilton and associates in Gold gulch has been sold to H. Finch and others of Colorado, who are making tests of ore to determine the best method of treatment preparatory to erecting a plant. A 10-stamp mill will probably be decided upon.

The Pacific Union Smelting Co. of San Francisco, Cal., has bought an eighty-ton stack and necessary machinery for a smelting plant to be erected by it at Lordsburg.

The National G. & S. M. Co. of Chicago, Ill., which recently bought the Old Beck and four other mines at Stein's Pass, is arranging to erect a fifty-ton concentrator with sufficient motive power to increase to 100 tons capacity.

The Mineral Mountain M. Co. of Chicago, Ill., is putting in a pumping plant on its mine at Stein's Pass. A fifty-ton concentrating plant and hoist are also being erected.

LINCOLN COUNTY.

The Eagle M. Co. of Parsons City has bought every mining claim, water right and homestead on the Bonito river from Parsons nearly down to Angus. The plans of the company anticipate the erection of an enormous cyanide plant for treating low-grade ores, which will take a large amount of water from the Bonito.

OREGON.

BAKER COUNTY.

The development of the Gem mine, in Sparta district, and the increase of richness of its ores are stated as the reasons for another enlargement of the plant. The Gem Con. M. Co. has been incorporated by A. Geiser, W. Pollman and D. W. French at Baker City, capital $1,000,000, to provide the additional capital.

The Don Juan mine, near Sumpter, owned by N. H. Thibault, with D. D. McLeod as manager, has been developed by 900 feet of tunnel, with winzes and upraises. A winze 100 feet deep has been sunk about 400 feet in on the tunnel and is being put down 150 feet farther. Five additional stamps have been started up in the mill.

One giant is ready to operate on the placer property of the Deer Creek Placer Co., of Sumpter. A second giant is to be installed soon. N. C. Richards is president of the company, and F. E. Hobson secretary and Supt.

The Uncle Sam group, on Bald mountain, near Sumpter, has been sold by R. H. and S. S. Start, of Sumpter, to a Detroit company, of which R. W. Hawley, of Detroit, Mich., is president, and D. F. Hawley, of Sumpter, vice-president and manager.

The Stice Gulch placer claims, near Sumpter, have been sold by H. K. Brown and J. S. Kenyon, of Baker, to V. T. Craig, of Craig, Neb., and J. A. McLaughlin, of Lincoln, Neb. The Stice Gulch Placer Mines Co. has been incorporated with H. K. Brown, president; D. L. Killen, secretary and treasurer, and J. S. Kenyon, Supt. and manager.

The North Pole mine, near Baker City, has recently shipped 25 tons of ore, said to be valued at $200 per ton, which is claimed to be rather low-grade ore for this mine.

GRANT COUNTY.

E. J. Godfrey, the principal owner of the Red Boy mine, of Granite, who recently made a consolidation with the Concord property, adjoining the Red Boy, and bought with J. H. Robbins, of Sumpter, the Golconda mine, which has since been merged into the Red Boy-Concord combination, is planning to install near Olive Lake, about midway between the properties consolidated, a large electric light and power plant.

JACKSON COUNTY.

Mr. Mendenhall, owner of the Roaring Gimlet mine, 2 miles from Gold Hill, has shipped twenty-five pounds of gold panned out by hand from the rich pocket recently struck in the ledge. Mr. Mendenhall bought the mine in March from Sutton & Reese, paying $10,000 for it. He has already taken out $20,000.

Major Andrus, Supt. of the Bill Nye mine, 4 miles west of Gold Hill, has made a rich strike in a 50-foot shaft on the ledge. It is nearly all $200 rock The mine has already paid $20,000 in developing it to a depth of 240 feet, and but little of the ore has been stoped out.

The Scandia Tunnel Co., of Spokane, Wash., has elected Dr. O. T. Melde president and C. J. Johnston secretary. The company is working on a long crosscut tunnel near Granite. W. Wade is manager.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Pluma M. Co. has the hoist and pumps in position at the shaft in northeast Lead, and the plant will be started up this month. The company has bought the machinery of the Galena M. & S. Co., removing it from the Eureka and Hoodoo shafts, in Bear Butte district. The Pluma shaft is about 200 feet deep, and it is the intention of the company to continue it to the 500-foot level and to then crosscut.

PENNINGTON COUNTY.

The University G. M. & M. Co. has commenced development on the ground bought of B. J. Heath, near Rochford. An open cut has been run across one of the ore veins, showing it to be over 40 feet wide at the surface. It is a white quartz, carrying gold.

UTAH.

BEAVER COUNTY.

The Frisco Silver Queen M. Co. of Richfield has been incorporated, capital $100,000, with H. Tuft president and J. Dorius, Jr., secretary. The company owns the Blue Bird Nos 1, 2 and 3 and the Humbug Nos. 1, 2, 3 and 4 claims in the San Francisco district.

Manager H. Jefferson of the Butte & Beaver property, near Milford, is running a drift from the bottom of the 100-foot shaft and has crossed some good stringers of ore.

Galena ore is now being taken out of the Orphan Boy mine, near Milford,

which will average about $100 in lead and silver.

J. H. Dupaix states that preparations are under way for a resumption of operations at the Amelia G. & S. Co.'s mines at Star. Several veins from 1 to 4 feet wide have been opened, the ore carrying silver values from $15 to $150 per ton.

The Utah Southern G. & C. M. Co. has been incorporated at Salt Lake City, capital $500,000, with E. B. Critchlow president and F. A. Earls secretary. The company owns the Bonanza and Bonanza No. 2, Annie J., Last Chance, Daisy and Daisy No. 2 and Ouray claims in the Beaver Lake district.

SALT LAKE COUNTY.

The Columbus M. Co. has been incorporated at Salt Lake City, capital $150,000, with T. Jacobson president and A. E. Snow secretary and treasurer. The company owns the C. K. and C. K. No. 2 and Columbus Nos. 2 and 3 claims in the Little Cottonwood district.

SUMMIT COUNTY.

The Utah Zinc Co.'s mill at Park City, erected to work the zinc ores of the Anchor mine, has been sold by Mayne & Leonard to W. Quinby of Boston, Mass. The plant, it is said, will be enlarged and put in operation.

SEVIER COUNTY.

The Annie Laurie mill in March treated 7300 tons of ore. The grading for the new tanks to increase the mill's capacity has commenced. Another electric plant will be installed to furnish power for the additional mill machinery.

JUAB COUNTY.

In cutting a station at the 800-foot level in the South Swansea shaft a fine body of ore was struck, with a strong flow of water. The ore body presented a fine face of galena, and is the same vein as in the 700-foot level, where it measures 20 feet between walls. With 100 feet of stoping ground above, Supt. Wheeler will at once begin hoisting.

Six thousand pounds of very rich ore has been sacked from a recent strike in the Mammoth mine, and stoping continues on a 2-foot breast. The ore is a mass of horn silver and heavy spar that is said to carry from twelve to fourteen ounces in gold. S. McIntyre, Jr., manager, believes it will net $15,000 a ton. The ore was opened on the first level below the tunnel.

In the Mammoth mine at Tintic an unexpected find of exceedingly high-grade ore has been made near the main shaft, 350 feet down and 150 feet below the old workings. The ore shoot is 2 feet wide, and picked samples have yielded values up to $400 a ton. The mineral is horn silver.

Marble quarries are being developed by F. A. Sweet, of Salt Lake City. The locations are in Juab county, and the rock is claimed to be of superior quality, translucent and almost snow white. The ledge was found less than a month ago, and the work of development is being actively carried on.

TOOELE COUNTY.

At the Cygnet mine at Stockton, T. H. Benton, manager, ore is being stoped on the 200-foot level from a chimney 20 feet long and 4 feet across. The ore is galena and carbonates and yields about 45% lead and 10 ounces of silver to the ton. The concentrator is being operated.

WASHINGTON.

KITTITAS COUNTY.

The Jumbo placer mine on Williams creek, near Ellenshurg, is producing a large quantity of coarse gold and many nuggets, having a value of $5 and up. The largest one contained $168 in gold.

SNOHOMISH COUNTY.

The owners of the Nonpariel group of claims, near Index, are about to put in a compressor plant and power drills. The tunnel is now in 220 feet, with a vertical depth of 200 feet. The face of the tunnel is in a concentrating grade of copper ore.

The Big Index G. & C. M. Co. has been incorporated by W. Frankfurt, J. C. Rathbun, G. R. Davis, F. J. Melvin, C. H. Thrall, H. E. Daniells and G. A. Knox, of Seattle. The company owns fifteen claims near Baring Station on the Great Northern railway.

STEVENS COUNTY.

The Hester M. Co. of Seattle has elected J. T. Ronald, T. Foran, C. W. Thompson, J. Gibson and F. Utterdacht trustees. The company's properties are in the Pierre Lake district and embrace two groups of claims with about 500 feet of tunnel and shaft work.

WYOMING.

CARBON COUNTY.

A vein of rich gold ore has been struck in the Rose mine at South Pass. The mine is owned by C. C. Hamlin of Colorado Springs, Colo., A. Kendall of Rock Springs and associates. A cyanide mill will be built to handle the ore.

In the construction of the aerial tramway from Grand Encampment, towers for the first section of 4 miles have been completed and the second section commenced. A new camp will be established at a point about half way between the smelter and the Ferris-Haggerty mine. The cables, which have arrived at Walcott, come on spools in sections weighing seven tons each. Fourteen-horse teams will carry them to their place in the line. The supply of timbers for the towers is not equal to the demand, owing to bad roads in the hills.

FOREIGN.

BRITISH COLUMBIA.

In the 1901 report of the Con. Cariboo mine at Bullion, Manager J. B. Hobson summarizes the work accomplished as follows: Total time occupied in washing in pit No. 1, 104 days 1½ hours; total quantity of water used, 258,250 miner's inches. Quantity of gravel washed—top deposits from upper bench, 2,417,162 cubic yards; gravel from lower bench, 3126 cubic yards; total quantity of gravel washed, 2,420,288 cubic yards; average duty of water per miner's inch, 9.37 cubic yards; gold product for season, 8351.78 ounces (troy); value of gold, $142,275 51. The average yield of the upper bench, clay, gravel and slide rock, from which 1687.78 ounces gold were recovered, was 14½ cents, while the lower bench gravel showed an average return of $1.27 per cubic yard of gravel washed. As previously stated, owing to the short water supply, only a small quantity of the available bedrock gravels were treated—in all about 3126 cubic yards—from which was recovered coarse gold amalgam and nuggets to the value of $3978, giving a very high return.

R. Dore, owner of the Grace Dore nickel mine, near Fort Steele, reports that recent assays gave returns of from 9% to 14% nickel. Developments consist of 85 feet of open cuts, 40 feet of tunnel, and a shaft 22 feet deep. The ledge has 3 feet of good ore, which carries high values in nickel and cobalt, with small values in gold and silver.

The Silver Crown M. & M. Co., at their annual meeting in Spokane, Wash., arranged to begin extensive development work on the Alice and Zuni claims, near Cody. Ore from the ledge, it is claimed, averages about 200 ounces in silver and 70% lead.

The banks of Atlin during the season of 1901 exported $211,000 of Atlin gold, and royalty was paid on $193,000. It is estimated that the hanks purchased considerably less than one-half the season's output, which would make the production for the camp last season over $500,000.

The Triune group, consisting of the Triune, Enterprise, Silver Chief, Kamloops and Revenge claims, near Ferguson, have been sold by the Ferguson Bros. to the Metropolitan G. & S. M. Co., Ltd., of Minneapolis, Minn., for, it is reported, $600,000. The new owners intend to work the mine on a large scale. A smelter within 1500 feet of the mine and an aerial tramway to carry the ore down to the smelter are contemplated in the near future. Two tunnels have been driven on the property and ore has been encountered from the grass roots down. The shoots are large and carry galena, lead carbonate and zinc blende, the carbonate being of extraordinary richness. The galena carries antimonial silver.

W. G. Rohh, manager of the Wellington mine at Whitewater, reports that from the last shipment of 15½ tons the net returns were $1592 37, being 236½ ounces silver, 44 6% lead and 19.1% zinc.

C. A. Sandiford states that a new company has been formed in England to work the Wakefield, near New Denver, and operations will commence in May, with W. Macdonald as foreman.

The final payment of $8000 on the Eva and Highland Mary claims in the Lardeau has been made by the Imperial Dev. Syndicate to A. F. Rosenherger. This property was located two years ago.

It is reported that J. Dalton has bonded his copper claims in the upper Rainy Hollow district, beyond Porcupine, to the London Exploration Co. for $125,000. J. Vickers has also given a working bond on his property in Rainy Hollow, presumably to the same company.

The Ruth mine, near Slocan, owned by an English company, with H. B. Alexander, manager, at Kaslo, has developed a body of ore in the mine, from which a shipment of 27 tons showed values of 180 ounces of silver and 14% of lead.

A. F. Gwin of the Yreka C. Co. of Tacoma, Wash., has started work on the Comstock group of copper-gold properties on Comstock mountain, Quatsino Sound, recently bought by the company. He states that for some time operations will be practically confined to quarrying the ore and conveying it to the shipping point, about 1 mile from the mine, where a temporary wharf is being built. The company expects to have several hundred tons ready for shipment soon. The average value of the ore is stated to be $21, mainly in copper.

R. Pierson, J. G. Pierce and J. M. Starbuck of Seattle, Wash., have bought the southern portion of the Wreck Bay, Vancouver Island, placer claims, and are negotiating for the claims worked hitherto by the Wreck Bay Placer M. Co. The new owners intend this year working the beach with machinery.

The Queen Victoria mine, which is situated near Beasley siding, in Nelson district, has a large surface showing of ore, which crops out on a bluff, and the development work so far done shows already a body of ore 400x300x150 feet. This ore is claimed to have an average value of about $9 a ton.

MEXICO.

Cananea, Sonora, is said to have 7000 population at the present time, and is divided between the old town, where the smelter is, and the new commercial town, one mile this side, where many houses are being erected. Two new furnaces are being added to the six now in use, and eight converters are shortly to be put in place. A new steel building, 100x300, is being finished, which will contain an electric overhead railway.

TRANSVAAL.

Considerable attention is being given to the practicability of gold dredging in the rivers in the eastern portion of the Transvaal and Natal. It is considered that in South Africa the working costs would not exceed 8½ cents per cubic yard, and it is estimated that with a suitable dredger at least 150 cubic yards per hour could be worked. The great drawback to gold dredging in South Africa would be that work would be possible only during a limited portion of the year, for when the rivers are in flood in summer dredging operations could not be carried on successfully, nor in mid-winter, when many of the water courses are practically dried up, so that the working season would probably amount to only six months in the year.

YUKON TERRITORY.

The Gold Commissioner's office at Dawson shows that the business transacted by it in 1901 has exceeded that of any previous year. Many abandoned and new creeks were opened, including Henderson, Montana and All Gold and their tributaries. More than a thousand claims each were recorded on Montana and Henderson creeks and their tributaries. The report contains these figures for the year ending November 30th: Free miners' certificates granted, 12,400; placer grants, original entries, 6330; renewals, 3700; relocations, 3800; assignments and mortgages, 10,150; documents relating to quartz claims, 1105.

Personal.

J. A. JENKINS, C. E., of Grass Valley, Cal., is at Keswick, Cal.

HENRY BRATNOBER of San Francisco, Cal., is at Seattle, Wash.

H. T. TRIPP is Supt. of the Sumdum M. Co. at Sumdum, Alaska.

E. W. HUNT, C. E., of Rico, Colo., is sojourning in Los Angeles, Cal.

M. BROWN is manager of the Conqueror group of mines at Empire, Colo.

H. F. CALENBERG is Supt. of the Jupiter Con. mine, at Iowa City, Cal.

C. S. THOMPSON has been appointed Supt. of the Corsair M. Co. at Creede, Colo.

S. C. MCCLURE has been appointed Supt. of the Elgin gold mine at Rochester, Mont.

F. W. HOAR, Supt. of the Old Dominion copper mine at Globe, is at Boston, Mass.

J. A. HUTCHINSON of Boise, Idaho, was in Salt Lake City, Utah, early in the week.

W. J. STEVENS has returned to Wardner, Idaho, from a sojourn at Grass Valley, Cal.

C. B. LAKENAN of Grass Valley, Cal., has been appointed Supt. Coe mine, at that place.

GEORGE E. ROBERTS of Washington, D. C., Director of the Mint, is in San Francisco.

T. HOATSON of the Calumet & Hecla mine at Houghton, Mich., is at Marysville, Mont.

G. MILLER of Ashland, Or., has been appointed millman at the Dewey mine at Gazelle, Cal.

G. S. BINCKLEY of Los Angeles, Cal., has been appointed manager of the Esperanza M. Co., operating on Cedros Island, Mexico, and will take personal charge at the mine this month.

O. CHATFIELD, foreman of the New Independence mine at Wolf, Cal., is in San Francisco, Cal.

P. BONERY, Supt. of the La Grange hydraulic mine at Weaverville, Cal., is in San Francisco.

ROBERT JONES, Supt. of the Canada Hill drift mine, near Westville, Cal., is in San Francisco.

J. H. DURST, Supt. of the Plymouth Rock mine, near Plymouth, Cal., is in San Francisco.

J. C. UNDERWOOD, manager of the Lozier M. Co. at Llana, Sonora, Mexico, is in New York.

R. B. PARK of Cleveland, O., has been appointed assayer at the Gold Bug mine at Georgetown, Cal.

J. B. YOUNG of Toronto, Canada, has been appointed Supt. of the Garcia mine at Wickenburg, Ariz.

J. BURSON, Supt. of the Arizona G. & C. Co. of Wickenburg, Ariz., is sojourning at El Paso, Texas.

RICHARD WALLACE has been appointed Supt. of the Independence Con. G. M. Co. at Cripple Creek, Colo.

WILBUR PARKER of the White Chief M. & M. Co., Chinipas, Chihuahua, Mexico, is in San Francisco.

W. G. NEBEKER has returned to Salt Lake City, Utah, from a trip to several mining districts in Idaho.

H. G. KANE, foreman Deer Creek M. Co.'s claims at De Borgia, Mont., is sojourning in Madison, Wis.

J. A. FLEMING, manager of the Black Warrior copper mine at Black Warrior, Ariz., is in San Francisco.

W. D. PINGSTER, manager of the Star mine at Columbia, Cal., has returned there from San Francisco.

T. MOFFETT of Butte, Mont., has been appointed manager of the Oregon Monarch G. M. Co. at Sumpter, Or.

T. D. BABBITT, manager Dewey mine, at Thunder Mountain, Idaho, was in Salt Lake City, Utah, on the 15th inst.

A. C. JARDINE, Supt. of the Bear Gulch M. & M. Co. at Livingston, Mont., has returned from St. Johns, N. B.

LAURENCE W. TATUM, M. E., of Chicago, Ill., manager of the Oro M. Co., has gone to the company's mine in New Mexico.

JOHN H. LANDIS has been nominated by the President as Supt. of the mint at Philadelphia, Pa., to succeed H. B. Boyer, resigned.

J. E. LAWRENCE, consulting engineer for the Sonora Dev. Co. of Moctezuma, Sonora, Mexico, is sojourning at Los Angeles, Cal.

N. TREWEEK of Lead, S. D., has been appointed consulting engineer for the Hidden Fortune M. Co., operating near that place.

GEORGE GRUSS has returned from Kalgoorlie, West Australia, and is at his former home at Genessee Valley, Plumas county, Cal.

J. A. YEATMAN, engineer of the Byron Jackson Machine Works at San Francisco, Cal., has returned from a trip to Salt Lake City, Utah.

A. F. HOLDEN, managing director of the United States and Centennial-Eureka Mining Companies of Bingham and Tintic, Utah, is in Boston, Mass.

JOHN R. MACLAREN of Glasgow, Scotland, is in Victor, Colo., engaged on an examination of Stratton's Independence mine for some of the Scotch stockholders in that company.

R. A. TREVARTHEN has resigned the superintendency of the Portland mine at Victor, Colo., on account of ill health. F. G. Peck, secretary of the company, is temporarily in charge.

Commercial Paragraphs.

THE Hendrie & Bolthoff Manufacturing & Supply Co. of Denver, Colo., will remove to their new offices in the Sheridan building, Denver, about May 15th.

THE Allis-Chalmers Co., represented by Geo. E. Ames, have removed their offices from 137 Montgomery St. to Rooms 622-623, sixth floor, Hayward Bldg., corner California and Montgomery Sts., San Francisco, Cal.

THE E. H. Sargent Co. of Chicago, dealers in chemicals and assayers' supplies, have bought the business of Richards & Co., and will remove to 143-145 Lake St., Chicago, where they will carry a large stock of chemicals and assayers' supplies.

G. L. HOLMES, who has charge of the placer mining machinery department of the Link Belt Machinery Co. of Chicago, is in New Mexico on business for his company. Mr. Holmes will make a most extended trip visiting all the prominent

placer mining camps of the West, Mexico and British Columbia.

THE J. Thompson & Sons Manufacturing Co. of South Beloit, Ill., has taken out incorporation papers under Illinois laws, with capital stock fixed at $300,000. The plant is to be greatly enlarged, new factory buildings being in course of construction at South Beloit. The company manufactures gas and gasoline engines, and hoisters, tools, etc.

UNITED STATES CONSUL HOLLIS at Lourenco Marques, Portuguese East Africa, reports that there is a demand in that country for steel cars, locomotives and other rolling stock, mining and electrical machinery, pitch pine, Oregon pine, etc., from the United States. The consul says he believes that a large trade in these lines can be created in Southeast Africa, the Transvaal, Mozambique and adjoining States.

THE Denver Engineering Works Co. of Denver, Colo., are receiving orders for large electric power and pumping plants for shipment to Mexico, the most recent installation being in the Candelaria mine, State of Zacatecas, which plant consists of two 125 H. P. engines, direct connected to 75 K. W. Crocker-Wheeler generators, together with switchboards and regulating apparatus. The Denver Engineering Works Co. have also just completed a carload shipment of sheet steel jackets for the copper matte furnaces at the Bingham Copper & Gold Mining Co.'s plant in Utah, which shipment will be followed by several carloads of similar jackets, now in process of construction. The large number of sheet steel jackets manufactured by this company has warranted the purchase of special machinery for this class of work.

Recently Declared Mining Dividends.

	Payable.
Gwin Mine Dev. Co., California, No. 32, 25 cents per share, $25,000	April 15
Ontario S. M. Co., Utah, 30 cents per share, $45,000	June 20

Latest Market Reports.

SAN FRANCISCO, April 16, 1902.

METALS.

SILVER.—Per oz., Troy: London, 24⅛d (standard ounce, 925 fine); New York, bar silver. 53½c, refined (1000 fine); San Francisco, 53½c; Mexican dollars, 44½c San Francisco, 43c New York.

COPPER. — New York: Standard, $11.00@11.50; Lake, 1 to 3 casks, $12.50; carload lots, $12.25; Electrolytic, 1 to 3 casks, $12.25; carload lots, $12.12½; Casting, 1 to 3 casks, $12.25; carload lots, $12.00. San Francisco: $14.00. Mill copper plates, $17.00; bars, 18@24c. London: £52 17s 6d per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £11 12s 6d per ton.

SPELTER. — New York, $4.35; St. Louis, $4.00; London, £17 16s 3d per ton; San Francisco, ton lots, 5½c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN. — New York, pig, $28.00; San Francisco, ton lots, 27c; 1000 lbs., 28½c; 500 lbs., 28½c; 200 lbs., 28½c; less, 29c; bar tin, ℔ lb, 32½c.

PLATINUM.—San Francisco, crude, $17 ℔ oz.; New York, $18 per Troy oz.

QUICKSILVER. — New York, $51.00 large lots; London, £8 15s; San Francisco, local, $47.50 ℔ flask of 76½ lbs.; Denver, $51.00. Export, $45.00.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 18½c; San Francisco, Plumbers', 100-lb. lots, 15.60c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $17.25; gray forge, $17.75; San Francisco, bar, 2.75 ℔ lb.,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $31.75; open hearth billets, $32.25; San Francisco, bar, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per bbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19.50; extra sizes higher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19.00; shingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No. 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11.75, long ton.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2¾@3c ℔ lb.; blue vitriol, 5¾@6½c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2¼@2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 76c; cs., 81c; raw, bbl., 74c; cs., 79c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 66c; cs, 71c; raw, bbl., 64c; cs, 69c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13½c; Mineral Seal, iron bbls, 19c; wooden bbls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 15½c; do., cs., 21½c; 86° Gasoline, bulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 20½c; Lard Oil, No. 1 bbl., 60c; cs., 65c; Neatsfoot Oil, bbl., 70c; cs., 72½c; No. 1 bbl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¾c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb, 7¼c; less than 500 lbs., per lb., 7½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¾c; do. in kegs, 7¼c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c.

ASSAY LITHARGE.—Per lb., 9c.

BISMUTH.—Subnitrate, per lb., $1.60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c: calcined, 20c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2⅛ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Catalogues Received.

The Sturtevant Mill Co. has issued a catalogue descriptive of the crushing and grinding machinery manufactured by it. It is well illustrated and full of information concerning rock crushing. The catalogue will be mailed on application to the Sturtevant Mill Co., Boston, Mass.

The California Wire Works of San Francisco has issued Catalogue No. 21, part 1, descriptive of the Hallidie endless wire ropeway. It contains many excellent illustrations of installations of this type of aerial tramway at mines. The methods of construction and operation are very clearly and completely described and the catalogue is a useful handbook of information to mine owners and others having difficult transportation problems to be solved.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING APRIL 8, 1902.

696,932.—VOTING MACHINE—A. J. Roiling, S. F.
697,395.—VEHICLE—F. Bosoh, Crescent City, Cal.
697,323.—PENCIL SHARPENER—E. Burke, Lakeview, Or.
697,303.—MITER BOX—R. H. Dorn, Los Angeles, Cal.
696,961.—OIL BURNER—Lizzie C. Graessle, San Jose, Cal.
697,084.—HYDRANT—W. Henderson, Los Angeles, Cal.
697,085.—SMOKE PREVENTER—J. H. Hobart, Denver, Colo.
697,087.—WIRE BED BOTTOM—J. Hoey, S. F.
697,088.—THRESHER FEEDER—M. I. Howe, Stockton, Cal.
697,257.—READING STAND—J. Kriwanek, S. F.
697,093.—VAPORIZER—G. H. Larkin, S. F.
697,376.—MECHANICAL DIRECTORY—G. W. Maxwell, Los Angeles, Cal.
697,377.—MECHANICAL DIRECTORY—G. W. Maxwell, Los Angelee, Cal.
697,378.—MECHANICAL DIRECTORY—G. W. Maxwell, Los Angeles, Cal.
697,379.—MECHANICAL DIRECTORY—G. W. Maxwell, Los Angeles, Cal.
697,380.—MECHANICAL DIRECTORY—G. W. Maxwell, Los Angeles, Cal.
697,381.—MECHANICAL DIRECTORY—G. W. Maxwell, Los Angelee, Cal.
697,382.—MECHANICAL DIRECTORY—G. W. Maxwell, Los Angeles, Cal.
697,368.—WASHER FASTENER—J. W. Shaw, Berryessa, Cal.
697,181.—BODY WARMER—R. E Smith, Portland, Or.
697,032.—TRUSS—T. C. Spelling, S. F.
697,038.—CAN TOP—J. B. Stewart, Chico, Cal.
697,183.—SUGAR PADDLE—C. Stout, Pomona, Cal.
697,224.—VEHICLE REACH—Travis & Denny, Medical Lake, Wash.
697,296.—WATER ELEVATOR—G. R. Tyler, Pomona, Cal.
697,120.—JEWELERS' TOOL—R. H. Wade, Elma, Wash.
697,054.—PULLEY KEY—F. Wiggine, Tacoma, Wash.
697,058.—HARROW TOOTH FASTENER—Glenn & Porteous, Freeno, Cal.
697,059.—CULTIVATOR—Glenn & Porteous, Fresno, Cal.
697,062.—ROASTING FURNACE—L. T. Wright, Keswick, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

READING STAND.—No. 697,257. April 8, 1902. John Kriwanek, San Francisco, Cal. This invention relates to a means for supporting books and the like, and it consists of a foldable adjustable frame, an adjustable stand having tubular sleeves, an arm adjustment carried thereby, upon which arm the book-holding frame is adjustably secured. In conjunction with this device is a clamp adapted to hold the leaves of the book, or any number of them that may be desired.

VAPORIZER, MIXER AND REGULATOR FOR OIL BURNERS.—No. 697,093. April 8, 1902. G. H. Larkin, San Francisco, Cal. This invention is designed for use in connection with burners for hydrocarbon oils. It consiete of a chamber having diaphragms formed therein to produce tortuous passages through the chamber. Steam and oil inlets connect with one side of the chamber and a burner pipe discharges from the opposite eide. These tortuous passages provide for such a continuous mixing and movement of the oil and steam that it will he discharged through the nozzle in the best condition for burning.

SMOKE PREVENTER.—No. 697,085. April 8, 1902. J. H. Hobart, Denver, Colo. The object of this invention is to provide for the consumption of smoke which arisee from the imperfect combustion of fuel in boiler furnaces and the like. The furnace has a bridge wall at the rear and beneath the boiler there are double arches forming an intermediate passage for the products of combustion, and means for supplying air to produce a draft transversely to the movement of said products through the passage. A second wheel having pigeonhole openings ie located in rear of bridge wall, with means for supplying air into passages above the openings and delivering it downwardly into each of the pigeonholes and transversely to the line of movement of the products of combustion.

WIRE BED BOTTOM.—No. 697,087. April 8, 1902. John Hoey, San Francisco, Cal. The object of this invention is to combine two elastic and essentially parallel separate and horizontal fabrics in a bed, so that all the desirable qualities of the readily yielding upper fabric may, when the weight is increased, be supplemented by a secondary and preferably less yielding surface below. In conjunction with these is employed a continuous yielding pad interposed between the surfaces, so as to gradually transmit the pressure from the upper to the lower one.

WANTED.—By a young School of Mines graduate, a position with reliable mining company as assayer, chemist and surveyor. Considerable surveying practice, besides one season with U. S. Geo. Survey. Can handle both and more, if necessary, for small company. State salary. Have had practical mining experience. Good references. Address "Worker," care of this office.

WANTED.

Consulting Mining Engineer,

familiar with making examinations of mines, prospects and mineral lands. Address stating experience and references. Moderate salary to start, with advancement to competent man. Position permanent if found satisfactory. Address A., care of Mining and Scientific Press.

L. Vogelstein,

90-96 Wall Street, NEW YORK.

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COPPER, ARGENTIFEROUS AND AURIFEROUS COPPER ORES, MATTES AND BULLION, LEAD, TIN, ANTIMONY, SPELTER.

DELINQUENT SALE NOTICE.

LARKIN MINING COMPANY.—Location of principal place of husiness, San Francisco, California; location of works, near Placerville, El Dorado County, California.

Notice.—There are delinquent upon the following described stock on account of assessment (No, 12) levied on the 5th day of March, 1902, the eeveral amounts set opposite the names of the reepective shareholders, ae follows:

Names.	No. Cert.	No. Sharee.	Amt.
W. E. Lutz	10	100	2 00
J. B. Quigley	291	250	5 00
J. B. Quigley	314	500	10 00
J. B. Quigley, Trustee	315	500	10 00
Dr. Owen Buckland	324	200	4 00
Dr. Owen Buckland	325	200	4 00
Dr. Owen Buckland	326	100	2 00
W. J. Likens	336	200	4 00
Chas. Downing	344	1,334	26 68
H. M. Holbrook	362	1,000	20 00
Dr. Owen Buckland	369	500	10 00
J. B. Quigley	375	250	5 00
W. C. Johnson	397	75	1 50
Ella Kirkham	404	200	4 00
W. T. Lally	414	300	6 00
W. T. Lally	415	200	4 00

And in accordance with law. and an order of the Board of Directors, made on the 5th day of March, 1902, so many shares of each parcel of such stock as may he necessary, will he sold at public auction, at the office of the company, 112 Main street, San Francisco, California, on MONDAY, the 5th day of May, 1902, at the hour of 2 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of sale.

N. F. REMINGTON, Secretary.
Office—112 Main street, San Francisco, California.

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The most independent and fearless mining journal published in the United States. Exposes all wild cat and fake schemes. Answers questions concerning all Colorado mining companies free of charge to subscribers. Send for sample copies and rates.
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MINING AND SCIENTIFIC PRESS

Whole No. 2179.—VOLUME LXXXIV. Number 17. SAN FRANCISCO, CAL., SATURDAY, APRIL 26, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

The Portland G. M. Co. Mill Near Colorado Springs, Colo.

On this page appears a bird's-eye view of the new Portland G. M. Co. mill now nearing completion near Colorado Springs, Colo. The view is on too small a scale to give an idea of the real magnitude of the plant, and of its technical completeness for the purpose for which it is designed.

Some idea of the magnitude can be gained from the figures of the quantities of material moved and placed, and an enumeration of the structures and appliances constituting the plant. In making the excavations 28,000 cubic yards of earth was moved. In building there was used 6,666 perches of stone masonry, over 1,000,000 brick, 50,000 cubic feet of concrete, 1340 tons of structural steel and more than 1,000,000 feet of lumber. The buildings consist of a crushing and sampling department, roaster, barrel house, concentrator, melting and refining building, power house, machine shop, boiler house, warehouse, office, pump house and cottages. They aggregate a floor area of 190,000 square feet, of which 40,000 square feet is cement. Enormous quantities of corrugated steel are used as siding and roofing and iron stairways connect the working floors. There is a 9-foot diameter self-sustaining stack 171 feet high. A system of narrow-gauge tram roads connects the buildings and departments. Seventy carloads of machinery have been installed, and 100,000 pounds of sheet lead and 50,000 pounds of lead pipe have been used. The steel ore bins have an aggregate capacity of 3,000 tons of ore. The water system embraces over a mile of 10-inch and 12-inch pipe and reservoirs of 33,000,000 gallons capacity. Automatic devices are installed for weighing the ore. The entire operation of the plant is to be by transmitted electric power. The machine shop is capable of turning out any work required by the plant. The treatment capacity is 300 tons daily, and the plans have been so made that a duplicate unit can be constructed harmoniously with it.

More interesting even than the technical features of the plant are the conditions under which it came to be built. The Portland G. M. Co., in common with other companies operating mines in Cripple Creek, Colo., has been sending its ore to custom smelters and custom mills. The recent combinations made in these interests have resulted in increasing the milling cost charges and deductions to such an extent that the profits in the mining of the ore were being absorbed by the smelters and the mills. The Portland Co., becoming satisfied that the profit their large production of ore was paying these outside interests could be added, where it properly belongs, to the company's dividends by building and operating their own mill, has built the mill, and it is safe to assume will increase their dividends as anticipated. It has made the mine independent of all combinations designed to fatten at its expense.

The fact that the mills built in the early days of the Cripple Creek mines have not been successful in operation should not be permitted to condemn the milling of the ores as being impossible. The early built mills were not built for Cripple Creek ore. Later ones that have been built for these ores have given satisfactory returns to outside milling companies. There is no reason why the same, or better mills more adapted to the Cripple Creek ores, should not produce equally satisfactory returns when operated by the mine owners. Certainly such mills owned and operated by the mine owners would permanently settle questions of smelter and milling trusts and combinations so far as those mines are concerned.

Bird's-Eye View of the Portland Mill, Colorado Springs, Colo.

An authoritative statement of an American Government official at Vladivostok, Siberia, declaring that the ukase of the Czar by which all mining is prohibited in the maritime province of Siberia for a distance inland from the shore of 100 versts, 66 miles, is still in force and will be enforced, should put a final quietus on the schemes of promoters who are announcing that they have concessions to mine for gold within the prohibited area. The prohibition extends to Russian as well as foreign mining. The Russians will not mind it and outsiders should not. The order covers the entire coast from Vladivostok, northward to the Arctic ocean. The only exception made to the order was in favor of two associations which had already started operations under old concessions. These are not on the market and it would be safe to leave them alone if they were offered. For the individual gold seeker there is nothing to look for in an attempt to mine in this territory but a chance at Russian prison life, which those who unfortunately have known it say is unattractive. No one should invest in any Siberian mining scheme proposing to mine in the maritime province no matter how attractive the proposition is made to appear.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

San Francisco, April 26, 1902.

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THE price of silver has had a persistent downward course for several months past, and it is now below the low point reached several years since. There is nothing encouraging in the market, and but one prospective influence that would tend to raise the price in the future. The one prospective influence is the opening up of China by the construction of large engineering works, railroads principally and after them, electrical and mining plants. These making large local expenditures for labor will pay for that labor in silver, thus increasing the quantity that annually disappears as consumption in China. This industrial development in China, which seems the only prospective influence that can cause a rise in the price, is still in the future. It is not born yet. Dealing with the situation as it is, producers of silver must look to lowered costs of production rather than higher sale prices to maintain profits. It seemed as if the lowered sale prices of lead and copper would restrict silver production and appreciate the price. This has not happened, however.

THE interests which have been attempting to permanently control the production of, and price of copper seem finally to have given up the attempt, and the indications are that copper will be allowed to take the price the market makes for it. The Metals Selling Co. of New York has lost the handling of the copper production of some large mines, which will hereafter be sold in the open market competitively. While there is considerable talk about copper appreciating in price to 14 cents a pound, it would seem that the present price of about 12 cents is closer to the average for a considerable period of time in advance of the present than 14 cents would be. As the situation clears, it becomes more and more apparent that the dominating production of copper will come from Arizona, Mexico, British Columbia and California. The ores that are being worked in the mines of these States and of British Columbia carry considerable gold values. The mines are not very deep, are easily worked and the ore bodies are enormous. Methods of reduction other than smelting, which are particularly applicable to these ores, have made it possible to produce copper from them cheaper than it can be produced in the older mines of Montana or in all but a very few of the Lake Superior mines. Mexico at the moment is notably increasing the production of copper and is preparing to increase it still more. From all accounts this production is made at a very low cost figure, and the enormous quantity of it can not fail to affect the market price. It is hardly probable that it will reduce it materially. The ultimate effect will be, rather, to close mines in the older districts that can not produce copper which will sell at a profit at 12 cents, or, it may be, as low as 10 cents. Copper production is a good business at 10 cents. The fact that a price can not be permanently held at 17 cents, or even 14 cents, should not discourage investment in and development of copper mines. The industry, however, should from now on adjust itself to 12-cent copper and cease dreaming about the golden time when copper was 17 cents.

MINING claim locations are not taxable in California, but some of them are taxed and some of them are not taxed. A good deal depends on the assessor and more depends on the claimant of the claim. The assessors, as a rule, are not given to examining the records to find what location claims a miner or prospector has. Unless the claimant tells the assessor, the latter is not apt to assess locations which have no improvements on them. Locations that are improved so that they have the repute of mines are always found by the assessor and a tax levied. The assessment valuation is usually made by the claimant and should not be high enough to hurt even his conscience. Practically the producing mines pay less than the prospecting or developing mines. There has been a practice in some counties of assessing the claims as personal property, and collecting the taxes in the same way as taxes on other personal property are collected. Other counties assess the claims as possessory rights, the same as claims filed under the homestead and pre-emption laws. As a rule, where mining locations are taxed the assessment has been so low that the sum of taxes to be paid has not justified the cost of a lawsuit to prevent the collection. It would seem that if any one were to litigate the question to a finish that it would be found, as stated in the beginning of this, that mining locations are not taxable. The deterrent condition against litigation, besides the smallness of the sum of money involved, is the fact that prospectors always want to sell their locations, and litigation over taxes would cloud an otherwise clear title and prevent a sale.

THE law that the mining industry in California gets is the kind that is always either useless or injurious to it. The Constitutional Amendment No. 28, to be voted on in November, while not aimed at it, scatters so, that its adoption would involve the mining industry in some political and business troubles it has been heretofore free from. Its adoption would be injurious to the industry. The provision of its scattering load that strikes mining is that giving the Commission created by the amendment the fixing of charges and determining the cost to mine operators of the electric light, power and water they buy from others. The fixing of maximum charges for water is under the existing law the duty of county supervisors. The other two are new inclusions in Government duties. Practically the several boards of county supervisors have found it impracticable to fix water charges for mining, and they have not done it. These county supervisors are, however, elected by miners and representatives of the mining industry of their several districts. The new Commission, not having this local responsibility and knowledge, would surely undertake to carry out the law. It is with power and electric light that the greater mischief will be effected. The amendment takes away entirely the right of mutual contract between the seller and buyer of electric light and power for mining. It introduces the varying dictum of an irresponsible third party, the Commission, who theoretically neither produce nor consume the electric light or power, as the substitute for the right of free contract. Neither the production of electric light or power is a monopoly nor can it be made a monopoly at any point in California, least of all in the mines. There are many sources of electric light and power and the individual is always free to manufacture his own supply. The sale of electric light or power to consumers needs no regulation except the power of contract by the parties directly interested. The consumer is not compelled ever to buy at the seller's terms or do without. In the mining regions of California the conditions and costs of power production differ at every plant. The conditions of consumption differ with every consumer. Private contract between the seller and consumer can and will naturally recognize the conditions. Commissions and Government regulation cannot do this. The whole inelastic practice of government would be a disturbing, disorganizing influence on business relations now perfectly harmonious, and from their nature impossible of being anything else. The fact that under the amendment the right of free contract for power will be taken away from the mine operators is sufficient cause for the vote of every miner in California against it.

THE Council of the Dominion of Canada have fortunately become convinced that the Treadgold concession would result in the serious injury of mining and commercial development in the Klondike and have revoked the grant, or at least materially modified it. This action is probably due to the personal representations of Governor Ross and the committee sent by the people of Dawson and the Klondike to Ottawa. The immediate effect of the change in policy is a striking proof of the impolicy of the concession. The claims that Treadgold and his associates were to have under the concession have been reopened to location by miners. According to reports, there were some 4000 of these claims, and a rush to get them has taken place, most, if not all of the claims, being taken at once. They will all be more or less developed and worked this season and will employ a large number of people. In the possession of Treadgold and his company it is unlikely that a tenth part of them would have been even prospected, and still more unlikely that a tenth of the number of people would have been employed. It is people who make a country, and people will not go into a country of solely mining resources unless they have the opportunity of profit from those resources. It is clearly to the interest of the Canadian Government to keep the placer mining localities open to individuals, favoring, if any favor at all be given, their small placer mining enterprises, rather than the larger ones of corporations. The country of the Klondike has prospered and grown as a result of this condition. One of its best recommendations to gold mining enterprise by individuals is the high rate of wages its mines have been able to pay labor. With these high rates of wages the mines are less attractive to outside capital, but a placer gold mining country can stand this condition as long as the placers will pay wages. The excuse for the Treadgold concession, the necessity of bringing in water by the expenditure of considerable capital, was simply an excuse, it was not an economic reason. The Klondike mines are rich enough to pay from their output the cost of bringing in water, and the history of other placer mining districts proves that the owners do bring in water supplies when the time comes that it will pay them. In the case of the Klondike it is estimated that $500,000 will provide an ample supply. The yield of the mines for this season is estimated at about $30,000,000, so the total cost of a permanent water supply is but a comparatively small proportion of a single season's yield of the mines.

IT is reported that the representative of some prospective buyers of a mine in Colorado declined to consider the proposition, unless the owners of the mine could show a written pledge of an authorized officer of the American S. & R. Co., that the company would treat a specified number of tons of ore from the mine daily. Nothing more conclusive as showing the dependence of the mining industry of Colorado on the smelting and milling combinations could be stated than this. It confirms what this journal has repeatedly insisted would be the condition of the mining industry as a result of such combinations of the smelters and mills. The condition makes the value of a mine dependent not on what it can produce, but on what the smelting and milling combinations will buy of it. Practically it makes the smelting and milling combinations the real owners of the mines, without the slightest risk or cost to themselves. These two combinations pay larger and surer dividends than all of the mines combined. But they pay them from the product of the mines, not mines that they themselves own, either directly or indirectly through subsidiary companies, but from the mines of outside owners. The condition is not normal for gold and silver mines under any circumstances, and should not be for lead mines. It is not necessary that it continue. But relief can only be permanently had when the smelters and mills are made as integral a part of the mining plant as are hoists and air drills. It cannot be had by more combinations of smelters that depend on custom working of ores.

Concentrates.

SILVER is the best conductor known for electricity, copper is second, gold third and aluminum fourth.

THE camber of a bridge is the rise of the chords at the center of a span over their level at the supported ends.

ONE TON of coal is about the equivalent for steam making of two cords of dry pine wood. Which is the cheaper depends on the prices.

CERTAIN PETROLEUM OILS obtained from wells in Ohio are refined by the use of certain copper sulphide ores. The process is a trade secret.

THERE is no statutory requirement that placer locations should be made in rectangular forms where they are not legal subdivisions of a section.

JUNIPER, when it can be had, makes an excellent charcoal for mine blacksmith work. Willow and alder also make a superior charcoal. Pine, fir, spruce, cedar and oak are desirable in about the order named.

THE usual loss of quicksilver in milling California gold quartz is about two ounces daily to each five stamps. It is less in some mills and very much more in others, dependent on the character of the ore and the rate of crushing.

NATURAL cement rock is burned at comparatively low temperature, as the hydraulic properties are affected by high temperature burning. Portland cements are burned at extremely high temperatures, 1800° F. to 2732° F., and even higher.

"CONCENTRATES" does not know of any smelting works where purely cobalt ores are reduced. Cobalt is generally associated as a lesser component of commercial nickel ores, and the nickel smelting plants recover the cobalt as a by-product.

PLATINUM ASSAYS can be made by any assayer. It is not necessary to send samples to Swansea, Wales, or indeed to any special point. If anything, Swansea assayers see less platinum than do the local assayers in most Western mining towns.

VERY good concretes can be made for foundations and fillings of piers, etc., in proportions of 1 cement to 4 sand and 11 gravel; 1 cement to 5 sand and 14 gravel; or, if stone be used in place of gravel, the quantities would be 9 and 12½, instead of 11 and 14.

TEN-ACRE legal subdivisions in placer claims can be patented without official survey. Five-acre subdivisions or two-and-one-half-acre subdivisions must be surveyed by a U. S. Deputy Mining Surveyor acting officially under instructions from the U. S. Surveyor General.

IN mine timbering it is calculated that square timbers are about one-fourth stronger than round ones of the same diameter. The safe load of a timber column is 600 pounds per square inch for heights less than 20 feet. Freshly cut timbers are from 25% to 40% weaker than when seasoned.

IT is probable that solutions of minerals hot, and under pressure, have made many more mineral deposits than have been made by the volatilization of the minerals either with or without steam. The pressures of great depth are so great that it is doubtful if much matter could exist in the gaseous state.

THE power required for a 20-stamp mill of 950-pound stamps will be not less than 2 H. P. and the extra power for crusher and other machinery depends entirely on the specific description of the machinery and the work required of it. Probably a 75 H. P. boiler and a 60 H. P. engine would make a satisfactory power plant.

WOOD PULLEYS can, in case necessity arises, be built up of inch boards. Small ones can be cut out of a single block, split with the saw and bolted over the shaft. After setting the pulley on the shaft the engine should be started up and the face of the pulley turned to a true circle, with the center crowning to hold the belt.

AT the Grand Forks, B. C., smelters there has been no trouble from fumes. The ores treated are self-fluxing and do require roasting in heaps in the open air, but go direct to the furnaces. There being little sulphur and arsenic in the ore, only a light smoke is given off and vegetation has not been killed in the vicinity.

THERE is no large or regular commercial demand for molyhdenite. Several of the large steel makers use comparatively small quantities for making certain grades of steel. The sale price of molybdenite is largely fixed by the supply in the market seeking buyers. The commercial grade of mineral must carry over 50% of molyhdenum.

THE idea of the early California miners that the gold-bearing blue gravels mined in the drift mines of the Sierra Nevada mountains were remnants of one original stream, which they called the blue lead, has long since been disproved. They are remnants of the beds of many streams substantially the predecessors of the existing stream beds.

IT has been held by the Supreme Court of New Jersey that the value of property proposed to he bought by a corporation must be reasonably near the price proposed to he paid. Any stockholder may require the acts of the directors to be reviewed, provided he believes himself injured. The fact that two-thirds of the stock assents to the acts of the directors does not bar him.

THE number of yards a miner's inch of water will "wash" in hydraulic mining in average ground cannot be stated. Other conditions besides the ground determine the commercial practice which ranges from 1 yard to the 24-hour inch to 24 yards to the 24-hour inch. Several articles have been published hy this paper giving the figures of ground washed in several instances.

THE use of explosive mixtures of air, with gas or oil as the prime mover energy in engines of the turbine type, has heen suggested, and it is possible some experiments have been made. Nothing of the kind has heen reported with any details. It would seem as though the theorems on which the different types of gas engines have been developed would not apply for a turbine type of engine.

THERE is no mother of gold. The suggestion that there is, is some old woman's tale. There is no indicator that can be used to point out the location of gold. By noting the stories of those who say there is it will he observed that the fellow who does the indicating, with the indicator, never gets any of the gold the indicator points at. The gold he gets is always out of some one's pockets.

THE difference between gravel and broken stone for concrete would seem to be largely a difference of opinion. Gravel has a less percentage of voids to be filled with sand and concrete. Tests made as to strength do not show any uniform superiority of broken stone over gravel. Given the choice hetween clean, hard gravel and a good grade of broken stone, it is safe to assume that the cheapest is the hest.

A STEAM POWER PUMP can be used to provide a hydraulic head of water for "piping" in a hydraulic mine. It would be used to pump water to a reservoir from which a second line of pipe would take the water to the hydraulic pit under a gravity instead of a pump pressure. Some installations have heen projected for doing the pumping with water power. Steam power is almost sure to prove too expensive to lift water for hydraulic mining.

NO SPECIAL proceeding is required to group four quartz claims so far as assessment work is concerned provided the same people own all the claims. When proof of assessment work is recorded the notice should show that the work was done for the several claims, naming them. If done for them in common one year it need not he the next. The grouping or consolidating for assessment work is thus a temporary matter of convenience.

THE case of the Ivanhoe M. Co. vs. the Keystone M. Co. is cited in Lindley on Mines as establishing finally the doctrine by the decision of the U. S. Supreme Court, that Congress in making school land grants to the States did not intend to depart from the uniform policy theretofore adopted in reserving mineral lands from sale, and that mineral found within a sixteenth or thirty-sixth section, known to be such at the time the grant took effect, did not pass to the State.

THE standard rule for the fixing of the horse power of boilers is that one horse power is the equivalent of an evaporation of thirty pounds of water per hour from a feed water temperature of 100° F. into steam at a gauge pressure of seventy pounds to the square inch. Engines have been improved so that they no longer take as much as thirty pounds of steam per hour to produce one horse power. Fifteen pounds is common and eleven pounds extra good work from a multiple expansion engine.

THE lower the velocity of flow of the water in the pressure pipe of a water power plant is the larger the portion of the total head effectively utilized, but the larger the pipe required for a fixed discharge of water. In deciding whether to use the larger pipe and lower velocity or the smaller pipe and higher velocity, the capital value of the earning of the power gained hy the saving in effective head of the larger pipe is measured against the saving of cost of pipe effected by the installation of the smaller pipe.

THE direction of the strike of mountain ranges has nothing to do with or without the presence of gold and silver. There are many more mountain ranges with a northerly and southerly strike than there are mountain ranges with an easterly or westerly strike. Naturally mines of gold and silver are more in evidence in the former. East and west ranges also carry gold and silver mines. This is the case with the mountain ranges in Spain, the Alps in Italy, and the Altai mountains in Siheria and Manchuria.

GAS produced from hituminous coal can be used to burn lime. A kiln built to use wood fuel or coal fuel might, or might not, he with a little alteration, adapted to use gas fuel. There would he an economy in operating expense to manufacture gas from the coal to use for the lime burning. How much economy would depend on the kind of gas made, and there would he an offset to saving by the interest and depreciation of the investment in the gas producing plant. With wood at $1.90 a cord and coal at $1.75 a ton no large saving would he possible.

VOIDS in aggregates of different gravels and hroken stones vary considerably. Sand contains of voids ahout 30%. Gravel, ¼ to ½ inch, contains voids of 36%. Broken rock, 1 to 2 inches in size, about 47%. A simple method of determining the percentage of voids in gravel or broken stone is to take a water-tight box of exactly one cubic foot capacity. Fill this with the material to he tested, shaking it well down, strike off the surface level and weigh. Broken stone, which is more or less porous, should first be soaked in water and drained dry. Water is poured into the box until it rises even with the surface and the hox weighed again. The difference is the weight of water in the voids. Estimating the latter at 62.25 pounds per cubic foot the percentage of voids is calculated.

IF all the proceedings necessary to obtain a patent to a mining claim are completed except the payment to the receiver of the local United States Land Office for the land, the claim may hecome forfeit and open for location by another person if the annual assessment work is not kept up. For example, in one calendar year in which no assessment work was done the claimant might carry through all the proceedings required by the statute to obtain a patent except the payment for the land, and if the latter was not made in that calendar year the claim would become forfeit and locatable on the first day of January of the suceeding year.

FAILURE to record a mining claim notice of location within ninety days after making it does not forfeit the location in California. It is hetter in every way, however, to conform to the law and record the notice. The record of the notice of location is legal notice to any adverse claimant that the location has been made and prima facie evidence of the facts it states. The posting of the notice on the ground is not by itself such a notice to any adverse claimant, and a locator who has not recorded his notice of location would be compelled to take the burden of proof as against an adverse clalmant in any court contest as to the right to the ground.

PUBLIC MINING RECORDS are not evidence of particular lands being mineral lands. This ruling of the Commissioner of the Land Office, if quoted to this journal correctly, probably was intended to mean that the records were not competent evidence of mineral or non-mineral character. If the miners who made the location were to make affidavit directly to the fact that there was valuable mineral known on the land at the date of the railroad land grant, that they had bona fide mining locations on the land, and that it was occupied for mining at the date of the grant, and occupied for mining at the date of the making of the affidavits, it is probable that the Commissioner would order a formal hearing to make findings of fact as to the real classification of the land. The public records of mining locations would then be competent evidence to corrohorate the testimony of the witnesses.

THE Supreme Courts of Colorado and the United States have held that blind leads discovered while projecting a tunnel through a prior valid claim cannot be claimed to be a discovery in the tunnel, and that tunnel claims located solely for the purpose of discovery have no right of way through lodes which lie in their course. The Supreme Court of Colorado has held in a late case that a vein discovered in a tunnel 250 feet beneath the surface may he located on the surface by simply projecting the course of the dip as disclosed in the tunnel to the surface and marking the boundaries of the claim from that point. It should be noted though that in this case the tunnel in which the discovery was made was not located or claimed under the statutes of the United States, but was commenced upon patented property belonging to another person and the work was done by his permission.

A BLACKSMITH describes his method of working steel into tools as follows: The steel is worked at an orange heat during the forging. When shaped, the next step is refining. This is done by hammering in water. A little water is put on the anvil and the face of the hammer is wetted. The steel must be at nearly red heat when this is done. The refining is repeated by reheating several times. After finishing this, the steel is heated to a dark red, so that it just shows the color, and dipped in raw linseed oil. The tool is reheated and dipped three times. The fourth time the reheat is carried to an orange color and dipped in the oil until nearly cold. The oil is then wiped off and the metal polished, care being taken not to hreak while polishing, as the metal is extremely hard. A large piece of iron is then heated to a red heat. The tool is laid on this with the heavy side down to draw whatever color is desired, different tools requiring different colors.

PLACER PATENTS have been repeatedly issued by the United States where the placer mining claims located suhsequent to May 10, 1872, did not conform to legal subdivisions. Old locations, made prior to 1872, are excepted from the requirements of conformity to legal subdivisions, and claims located later adjoining them had to conform to the already fixed houndary lines, and could not he located in legal subdivisions. It is not required that on unsurveyed lands there shall be any conformity to legal subdivisions, nor if the puhlic land survey is made suhsequently it is not necessary to change the locations to make them conform to the subdivisions of the public land survey. The provision of the law that only placer mining lands can be patented as such has aiso been made unavoidably the reason for not requiring strict conformity with the letter of the statute. River bed claims could not well be made to conform to legal subdivisions, and the Land Department officials have practically recognized this, and have also recognized the fact that the public land surveys in the mining districts, particularly where the older surveys were made, are so inaccurate that the mining claim locator could not without a survey locate his claim properly on legal subdivisions. The provision of the statute has, therefore, so frequently heen honored in the breach that strict conformity with it need not he considered an essential of a valid placer location.

Experiments With Bromo-Cyanogen on Southern Gold Ores.*

By S. H. BROCKUNIER.

During the examination of a gold property in Georgia last summer, I had occasion to study the effect of different chemicals upon the ore, the object being to find a more economical method of extraction than chlorination, as practiced there, had proved to be. Some of my notes and results may be of interest to others.

The country rock consists of mica schist, hornblende schist and black slate. The vein matter is quartzite and schist, containing some stringers of quartz, the whole forming a body from 20 to 50 feet wide. All of the rocks in the vicinity have become disintegrated to a depth of from 50 to 75 feet, forming the so-called saprolite.

I found the workings to represent two distinct classes:

I. Open-cut surface ore: Very soft, oxidized and disintegrated; containing much alumina, silica and iron; average value, $4 per ton.

II. Ore from lower levels: Quartzites and schist; very hard; containing much silica and manganese, some alumina and from 2% to 10% of pyrites; average value, $8 per ton.

Class I. was soon dismissed. The only way to make it pay would have been by the use of steam shovels and a large crushing plant. The tendency to slime would be the principal difficulty.

Class II. presented an interesting study. The values seemed to cling closely to the sulphurets; yet, while little or no gold was visible to the eye, it was almost always possible to obtain colors by panning. The gold so obtained was always very finely divided.

The stamp mill was started as nearly like its previous working as possible, in order to observe and correct its faults. The old method of 4-inch drop, 4-inch discharge, 100 drops per minute, 35-mesh screen, no inside plates and five stamps to one vanner, was not at all satisfactory. We almost immediately shut down twenty stamps, put all the vanners on the other twenty, increased the drop to 6-inch and the discharge to 7-inch, the number of drops to ninety and the screen to 40-mesh. This gave better amalgamation and we were able to use inside plates; but at the best we could only save 20% of the value of the ore by amalgamation.

The mine ore was concentrated twenty tons into one at a cost of $1 per ton of concentrates, which were hauled to the chlorination plant for treatment. I understand that this plant was erected from specifications of the well-known Thies process. It consists of two 40-foot single-floor reverberatory furnaces, two 4-ton chlorination barrels and a full equipment of filters, precipitation tanks, etc.

Laboratory tests had shown that the ore was difficult to roast and that the extraction would not be high; nevertheless, we made a fair test of the plant, with the following results:

TABLE I.—COST OF ROASTING ONE TON PER FURNACE PER 24 HOURS.

Labor	$2 40	
Wood	1 20	
		$3 60
(Decided loss of gold by volatilization.)		
Cost of treatment per ton, chemicals, labor, etc	$2 50	
Total cost per ton of concentrates		$6 10

The extraction was from 60% to 70%, which, on $12 roasted concentrates, meant $8.40, obtained at a cost of $6.10. The additional cost of mining, milling, concentrating and hauling being considered, it was clearly a losing business.

Experiments were now begun in two directions: (1) The classification, and (2) the chemical treatment, of the pulp from the stamps. These were afterwards combined, so that the experimental plant consisted of three tanks, each 6 feet in diameter, 4 feet deep, and placed so that the overflow passed from the first into the second and from the second into the third. The pulp from the stamps entered the first tank and was there kept agitated by a current of air through perforated pipes in the bottom of the tank. The heavier particles settled in this tank. The second was merely a settling tank, where the middlings sank through still water, allowing the slimes and finest particles in suspension to overflow into the third tank. These slimes were caught in the third tank by a perforated false bottom, which was overlaid by a filter bed of cheese cloth, matting and charcoal.

TABLE II.—RESULTS IN CLASSIFYING SURFACE OXIDIZED ORE.

65% settled in first tank; assay value per ton	$6 80
34% " second " " " "	4 00
1% " third " " " "	4 40

TABLE III.—RESULTS IN CLASSIFYING UNOXIDIZED MINE ORE.

35% settled in first tank; assay value per ton	$8 00
63 5% " second " " " "	12 00
1.5% " third " " " "	6 00

These results were rather surprising, because we had been told that the quantity of slimes was much larger and that the principal values lay in them. Our tank system clearly disproved this, because all the gangue was caught. That the values were not in the slimes was further confirmed by experiments on a canvas table.

Laboratory tests with "straight" cyanide upon unroasted ore showed an extraction of 40% to 60% of the gold, but with large consumption of cyanide, which was partially, but not effectually remedied, by a preliminary alkaline wash. With roasted ores an extraction of 80% was secured, but the loss of cyanide was still too large.

We then undertook a series of experiments with bromo-cyanogen of varying strengths, and the final results were entirely satisfactory.

We made our bromo-cyanogen by the following reaction:

$$5NaBr + 16HCl + K_2Mn_2O_8 + 5KCy + H_2O = 5BrCy + 2MnCl_2 + 5NaCl + 7KCl + 9H_2O.$$

Care was taken to have final solution slightly alkaline.

Our first attempts to make the bromo-cyanogen in this way were not successful, hydrolysis of the cyanide occurring and ammonia being formed.

It would have been cheaper to use KBr; but it was not available at the time.

Other oxidizing agents and acids were tried; but the best results were obtained by above method.

One and one-quarter ton of mine ore, assaying $6.80 gold per ton, was taken for our first trial; there was, therefore, $9.06 in gold to be extracted. The ore was treated in the first tank, where it had been separated in our tank experiments. One-third of a ton of bromo-cyanogen solution was run on, the original strength of which was: KCy = 0.07%; KCyBr = 0.10%.

TABLE IV.—RESULTS OF TREATMENT WITH KCyBr SOLUTION.

Time.	Milligrams of Au per A. T.	Extraction. Per Cent.	Strength of KCy. Per Cent.
At beginning	....	....	0.07
After 3 hours	0.22	16.0	0.05
After 16 hours	0.24	17.9	0.027
After 24 hours	1.14	83.8	0.025
After 30 hours	0.56	41.0	0.005
After 48 hours	0.28	16.9	0.0006

The pulp was stirred by air before each sample was taken. Assays of the gangue during the treatment showed that the loss of values in the solution during the leaching was by precipitation, and experiments were therefore undertaken to discover the cause and remedy.

The same amount and grade of ore treated with plain cyanide (strength 0.147%) showed an extraction of only 10.93% in forty-two hours and a loss of 75% of cyanide. The effect of air forced through KCyBr solution was investigated; but it caused no such great loss of cyanide as is shown in these tests. With roasted ore and KCyBr solution we obtained a 60% extraction, but at the cost of large consumption of cyanide.

Treating ore with preliminary alkaline wash decreased the consumption of cyanide, but lessened the percentage of extraction. We finally gave the ore both an acid and an alkaline wash and obtained the following result:

Two tons of ore treated, assaying $8 per ton, therefore $16 in gold to be extracted.

1. Preliminary wash of dilute H_2SO_4 (1 part acid to 300 to 500 parts water): contact one hour.
2. Wash of plain water.
3. Alkaline wash of KHO, in this case two pounds KHO to one to two tons water (determined by titration): contact one hour.
4. One-half ton KCyBr solution run on (strength of KCy 0.33% and of KCyBr 0.30%).

TABLE V.—RESULTS OF KCyBr TREATMENT AFTER ACID AND ALKALINE WASHES.

Time.	Milligrams of Au per A. T.	Extraction. Per Cent.	Strength of KCy. Per Cent.
At beginning	....	....	0.33
After 30 minutes	....	....	0.33
After 5 hours	0.55	33.8	0.32
After 8 hours	0.56	35.0	0.32
After 24 hours	0.75	47.0	0.31
After 36 hours	1.00	62.5	....
After 45 hours	1.10	69.2	0.30

Our extraction, therefore, was $11.07 gross, or $5 53 per ton from our $8 ore. To this add the 20% extracted by the stamps, and we have a total extraction from the raw ore of 75.3%. From $10 ore—which was the value of the ore under discussion before treatment by the stamps—we therefore obtained $7.53 per ton. The cost of this process for mining, milling and treatment, under a fair estimate, was $5 per ton, leaving a net profit of $2.53 per ton.

We think that the extraction from raw ore can be raised to 85%, and that, with a large plant specially constructed, the cost can be much reduced.

It was found by blowing the slimes out that, by this arrangement of tanks, the resulting ore could be treated directly in the tanks without subsequent handling, merely diverting the pulp coming from the stamps to a second series of tanks while the first series was being treated. In our work the third tank was merely a safeguard, as in none of our tests did values in it run high enough for treatment. We used the air introduced into the bottom of the tanks to stir the pulp at regular intervals and found it more thorough and economical than hand labor.

Exhaustive experiments are contemplated to decide more exactly about the preliminary washes, to determine the adaptability of electrolytic precipitation to this process and to enlarge the plant.

I am convinced that the future of gold mining in the South, and perhaps in some other sections, depends upon this or some similar process for the extraction of values, rather than upon the methods heretofore pursued.

Acknowledgments are due to Charles I. Auer and John H. Bower, who materially assisted in these experiments.

* Trans. American Inst. Min. Eng., Mexican Meeting, Nov., 1901.

Concentration of Ores by Oil.

Written for the MINING AND SCIENTIFIC PRESS.

The Elmore process of concentration of ores with gold is still the subject of experiments at the testing mill in London erected for its investigation. This mill is, on a practical working scale, of a capacity of ten to twenty tons per day, according to the ore. Tests have been made on shipments from a number of different places, including California, British Columbia, Western Australia, Africa and South America. A late test on copper ore from Copperopolis, Cal., which it seems impossible to concentrate by water, has been very successful. Concentration first effected after crushing in the Huntington mill by treatment on a Frue vanner showed an excessive loss of the floating and brittle copper-bearing minerals, and the production of a concentrate not very rich in copper, owing to the proportionally higher saving of iron pyrites present to that of the copper pyrites. The tailings of the Frue vanner treated by the oil process were almost absolutely cleaned from mineral, both iron and copper pyrites giving a concentrate 50% higher in value than the vanner concentrates and tailings containing a mere trace by assay of copper.

Tests made on the low-grade ore of one of the Rossland mines in British Columbia gave the following results: The concentrates by the oil process contained 6.08% of copper, while concentration by water gave only 2.6%, the silver and gold contents being proportionally higher and the tailings showing much higher recovery in the case of the oil than by water concentration.

At the present time working tests are being made on the telluride ores of Western Australia, which by the existing processes are costing at least 15 dwts. to work, so that ore below one ounce of gold per ton is necessarily passed by, while it is believed to exist in very large quantities. The oil process is capable of treating the finest of slimes and float mineral, provided, always, this mineral is of the character adapted to absorption by the oil. Tests on some Colorado silver ores, in which gray copper and brittle silver ore is disseminated through a gangue, part of which is heavy spar, have been successfully made by the oil process with the saving of a high-grade concentrate without excessive loss—a result impossible by a separation dependent upon specific gravity alone in concentration by water.

A 50-ton mill is now running in Norway on an ore consisting of copper and iron pyrites in quartz, the mineral carrying gold in addition to copper value. The arrangement of the mill is as follows: Three batteries of five stamps, with screens of 20-mesh, deliver to three McDermott "sizers" or submerged screens of 30-mesh. The coarse discharge from these sizers goes to one Wilfley table, and the fines passing the screens are treated on three 6-foot Frue vanners, the tailings of which pass through the oil process plant, consisting of two units of three mixing cylinders each. The results of working this mill are not yet published. In addition to this plant lately started, two mills of 100 tons per day and one of 50 tons are now being built for English copper mines.

In Foundry some rules for casting aluminum are given by H. Tuttle. The metal, he says, should be poured as cold as possible, thin castings being harder than those of heavier sections, but on general principles the rule holds good in all cases. A convenient way of ascertaining the temperature of the metal is to stir it with a pig of aluminum if its color is red until it is white, the melting of the pig serving as a guide to this point. The end of the cooled pig is then dipped three-quarters of an inch or so into the metal, the aluminum chills around the pig, and when the latter is withdrawn from the melted metal it remains like a little cup on the surface of the handle. The time required for this chloride metal to melt gives a good idea of the metal in the crucible. Dry sand is to be used and sponging the mold is to be avoided. The metal is to be poured very rapidly, as it is not as liable to wash away portions of the mold as other metals on account of its lightness. It is not necessary to ram the molds nearly as hard as for iron. Soft ramming will prevent the breakage of castings, as aluminum just after it solidifies is very weak and crumbling and will scarcely bear its own weight.

Compressed Air for Mining from Electric Power.

Written for the MINING AND SCIENTIFIC PRESS by JOHN B. TREGLOAN.

This paper records some actual results obtained, using a 10x18-inch duplex, single stage, belt driven compressor, the area of the outlet ports being 9 square inches on each end of each cylinder, the port area being reduced to 6¼ square inches where it enters the main pipe, a disadvantage, but in this particular compressor, unavoidable. The water jacket covered only three-fourths of the surface of cylinder, one-quarter being taken up by the air ports, another defect in construction. The working pressure varies from seventy-five pounds to eighty-five pounds, blowing off at eighty-five pounds. The compressor runs fifty-nine revolutions per minute, the valves being the ordinary poppet type.

30 H. P. Motor and 10x18-Inch Duplex Compressor, Spring Hill Mine, Amador, Cal.

In driving this machine a 30 H. P. General Electric induction motor is used, speed 900 R. P. M., voltage 550, the current being transformed from 10,000 volts in a separate building, about 250 feet from compressor house, and measured on the low tension side by an integrating Schallenberger watt meter, 746 watts being considered the equivalent of a mechanical horse power. The current is transmitted from the Standard Electric Co.'s plant, near Jackson, Amador Co., Cal., a distance of 8 miles. The price per H. P. meter measure is $6.50 per month, which is the maximum rate, and which is reduced somewhat according to the amount of H. P. contracted for above a certain amount.

The compressor pumps directly to a small receiver—in this case too small by 500 cubic feet—the total storage being only about 100 cubic feet, allowing altogether too sudden fluctuations in air pressure and not enough to carry all the air compressed during the small periods of idleness, of power drills and hoisting engine, without blowing off air.

Air Pipe From Compressor Entering Boiler, Spring Hill Mine.

This brings up an important point in compressor practice, that blowing off air is a large item of expense, is wasteful, and an apparent negligence of proper installation, but for some unaccountable reason is generally considered unavoidable in a compressor plant. Have plenty of storage and the right size compressor, and compressed air will be economical and not expensive, as is the opinion of most users of air compressors.

In this case the blow-off of the receiver is so arranged that it empties into the steam boiler, where it is reheated and used in hoisting engine, passing in just above the water line, through front end of boiler, as shown in the illustration herewith. When the power drills are not operating the lever is raised and all the air passes to the boiler for hoisting purposes. Attention is called to the sketch showing the general arrangement of plant; where possible to do so elbows are avoided and long sweeps are used, by bending the pipe — these bends being made very carefully to avoid any crushing of side of pipe.

Where pressure in receiver rises above seventy-five pounds it overcomes the weight and escapes through the 3-inch check valve; it passes out the side opening of 2½-inch tee, through which passes the stem shown in dotted lines and passes to steam boiler. A check valve shown in the photograph prevents the steam from backing out of boiler when air is below steam pressure — this arrangement makes the blow-off on steam boiler the blow-off of compressor.

Air is used cold in the power drills, but in the engine it is reheated to about the temperature of steam at forty pounds pressure.

The average consumption of fuel used in combination with electricity for sixty days was:

Twenty H. P. per day at a cost of	$270 00
Wood burned in mean time, 37½ cords at $6	225 00
Total cost for power	$495 00

Under former conditions it required:

Two cords of pine wood per day, 120 cords, at $6	$720 00
Water power for compressor (very favorable conditions) two months	350 00
Total by wood and water	$1,070 00
Tons of rock broken by power drills, and hoisted 550 feet	2,667
Tons of water hoisted 600 feet	3,600

Under the present conditions should the power drills and hoisting engine be idle all at once for more than one minute the air blows off, due to lack of storage, which as soon as rectified should make a difference of at least ten cords of wood. Electricity at $6.50 per H. P. month is about 21 cents per horse power for twenty-four hours, consuming, as this plant does, about 20 H. P. per day, means $4 50 per day to produce enough air at eighty pounds pressure to operate two power drills (3¼-inch cylinders) and leave a surplus for hoisting engine sufficient to save the use of over one and one-quarter cord of wood per day. Had all the air pumped to eighty pounds been conserved by ample storage the use of less than one-half cord of wood would have been sufficient for all reheating purposes and supplying steam at times when air pressure was low.

Below is given the fuel cost of power by oil, where it will be noted that the cost per horse power for twenty-four hours is 38 cents; by electricity for twenty-four hours, 21 cents, at $6.50 per H. P. month; by wood, at $6 per cord, 53½ cents, as near as can be estimated. Very few mining plants are equipped with as perfect a boiler plant as was the boiler plant used in gaining these results by oil:

FUEL COST OF POWER BY OIL.

One barrel 16° oil =	330 pounds
At $1.50 per barrel delivered =	$0.00455 per pound
Heat units per pound =	18,000
Heat units per pound of steam at 100 pounds, with feed water at 50° F. =	1,167
Theoretical evaporation pounds of water per pound of oil =	15.4
Actual evaporation, assuming 65% efficiency for boilers, including steam required for vaporization, pump, etc. =	10.00
Allowing 35 pounds of steam per H. P. hour on engine, including feed pumps, etc., pounds of oil per H. P. hour, will =	3.5
Fuel cost per H. P. hour=$0.00455 × 3.5 pounds =	$0.0159
Fuel cost per H. P. hour for 24 hours =	$0.38
Fuel cost per H. P. hour per month =	$11.40
Fuel cost per H. P. hour per year =	$136.80

The cost of reheating air in a steam boiler is very trivial; for every twenty-four pounds of good coal used in reheating compressed air at about eighty pounds pressure an additional horse power for twenty-four hours can be secured, whereas it requires under good conditions from 96 to 120 pounds of good coal to get one horse power for twenty-four hours from steam.

Two cords of good pine wood is generally taken as the equivalent of one ton of good coal, and fuel oil at $1.12½ per barrel is about the equivalent in heat production under a steam boiler to good coal at $5 per ton. The efficiency of an electric motor is from 85% to something above 90%, whereas from use of wood, coal or oil there is a tremendous loss of heat, in radiation and in heat going up the stack, so that probably 15% would represent about the efficiency of a steam plant.

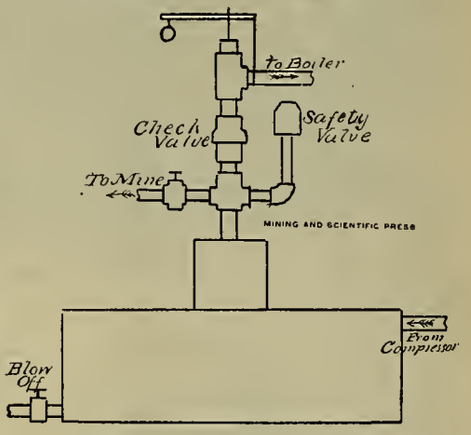
For the guidance of those who may contemplate the use of air the following general directions will prove most satisfactory, from a power standpoint as well as maintenance:

Get a compressor that does not require to be run above 200 feet of piston speed per minute.

Use a two-stage tandem straight-line machine when possible.

Have heavy flywheels.

Avoid countershafting, by using large flywheel.



Have the stroke at least double the diameter of cylinder.

Have long stroke machines rather than short ones.

Have storage that will require the compressor at least one-half hour to fill.

Have the compressor equipped with an unloader.

And above all, have a compressor as nearly equal to the work to be done as possible. The larger the compressor the more dead work, in friction. These may seem commonplace suggestions to a great many, but are the elements that, either considered or neglected, go to make a successful and satisfactory plant or a very unsuccessful and unsatisfactory one. As much intelligence and experience is required in the installation of a compressed air plant as in electrical or other power plant installations.

Amador City, Cal., April 1.

A Cheap Bullion Retorting and Melting Furnace.

To THE EDITOR:—The retorting item in the interesting article of C. P. Richardson, of April 5, recalls to mind that a useful fuel for retorting seems to be generally overlooked. I allude to fir bark—plentiful in most camps on this coast.

In using a forge for retorting and melting, clean out the "duck's nest," lay on a piece of firebrick, old crucible or other infusible material. Make a wall of common brick, rock or other available material, banking up outside with cinders, etc., on the forge, leaving from 2 to 3 inches of space between the wall and retort. Break the dry bark to pieces about 2 inches square (a sharp pick is handy for this); fill in loosely around and over the retort. Pour on a little coal oil and light. If the retort is not more than two-thirds full the bellows can be worked gently, drawing fire to the bottom, and the speed in heating can be thus regulated. The bark burns without flying or going out. It will gradually heat to retorting point without the bellows' aid, and is thus allowed to heat when the retort is filled to its limit. Sufficient bark is kept on to finish at a red heat.

While retorting the crucible is well warmed. As soon as the retorting is finished, the gold is removed while hot, broken up and put into the crucible with proper flux. The crucible is then set in place of the retort, the charred bark put around it, coal added while the bellows are worked, and air vents made around the crucible. In the absence of coal, bark may be used.

This may seem like crude work, but it is so expeditious, efficient and cheap, that I prefer it to any other method where not more than fifty to sixty pounds of amalgam is handled at one time. Starting with everything cold, three hours is sufficient time for one man to retort, and melt to bullion, the above amount of amalgam. E. L. BALLOU.

Igo, Cal., April 15.

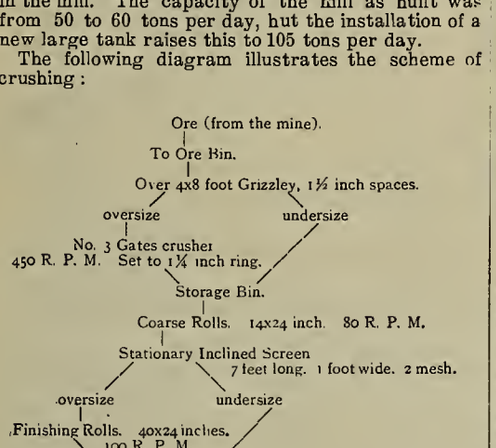
The Cyanide Plant of the Wasp No. 2 Mining Co., Kirk, S. D.

This mill was built during the early part of 1900 and began operations about September, 1900. It has been running continually since then. It is a dry crushing mill, but has no facilities for drying the ore, there being but little necessity for that, due to the coarse crushing that is done and the dry nature of the ore. The mine is within 250 yards of the mill, the ore being transported in trains of four cars, by mule haulage. The cars hold 1500 pounds of ore, are of the end dump type, and discharge into the main storage bin, of small capacity, which feeds to the crusher floor.

NATURE OF THE ORE TREATED.—The ore is of the quartzite variety from the Potsdam. In the greater part of the ore the gold is carried seemingly on the cleavage planes of the quartzite, and is not finely disseminated, as is usually the case, although the mine also has some of this latter class of ore. The fact that the gold is carried in the cleavage planes makes coarse crushing permissible, manifestly a great advantage. Very little pyrite is present, but some antimony in the form of stibnite is found, although only in small quantities, not sufficient to cause trouble in cyaniding. The value of the ore varies considerably, generally running between $4 and $20 per ton, the greater part being nearer the first figure than the last. The ore is at times quite acid, requiring considerable lime to neutralize it.

THE CRUSHING OF THE ORE.—The mill site is very favorably situated as regards slope, full advantage being taken of gravity, there being but one elevator in the mill. The capacity of the mill as built was from 50 to 60 tons per day, but the installation of a new large tank raises this to 105 tons per day.

The following diagram illustrates the scheme of crushing:


Ore (from the mine).
To Ore Bin.
Over 4x8 foot Grizzley, 1½ inch spaces.
oversize
undersize
No. 3 Gates crusher
450 R. P. M. Set to 1¼ inch ring.
Storage Bin.
Coarse Rolls. 14x24 inch. 80 R. P. M.
Stationary Inclined Screen
7 feet long. 1 foot wide. 2 mesh.
oversize
undersize
Finishing Rolls. 40x24 inches.
100 R. P. M.
Bucket Elevator.
Shaking Finishing Screen. Situated on a level with coarse rolls.
oversize
undersize
Returned to Finishing Rolls. by gravity
Finished Product Bin.

THE CRUSHING AND SCREENING MACHINERY.—The grizzly is 8 feet long, 4 feet wide, with 1½-inch spaces. It is inclined at 45°.

Coarse crushing is done in a No. 3 Gates crusher, breaking to a 1¼-inch ring. The capacity of the old No. 2 crusher was about 60 to 65 tons per twenty-four hours, and it was found necessary to put in a No. 3 Gates in order to come up to the increased tankage capacity when the new tank was installed. It has been found that a No. 2 Gates has a too limited capacity, even for a 60-ton mill, as the wet ore rapidly decreases its capacity. It is also the experience that the mouth openings are rather too small for the mine rock, so that too much sledging has to be done.

Coarse Rolls (One Set): These are Gates rolls, 24 inches in diameter and 14-inch face, making eighty revolutions per minute. The ore is fed to the rolls by Tulloch automatic feeds. The rolls are not housed, as the ore is damp enough to avoid much dust.

Finishing Rolls (One Set): These are of the same make as the above and the same size, but make 100 revolutions per minute. A Tulloch feed also supplies these rolls.

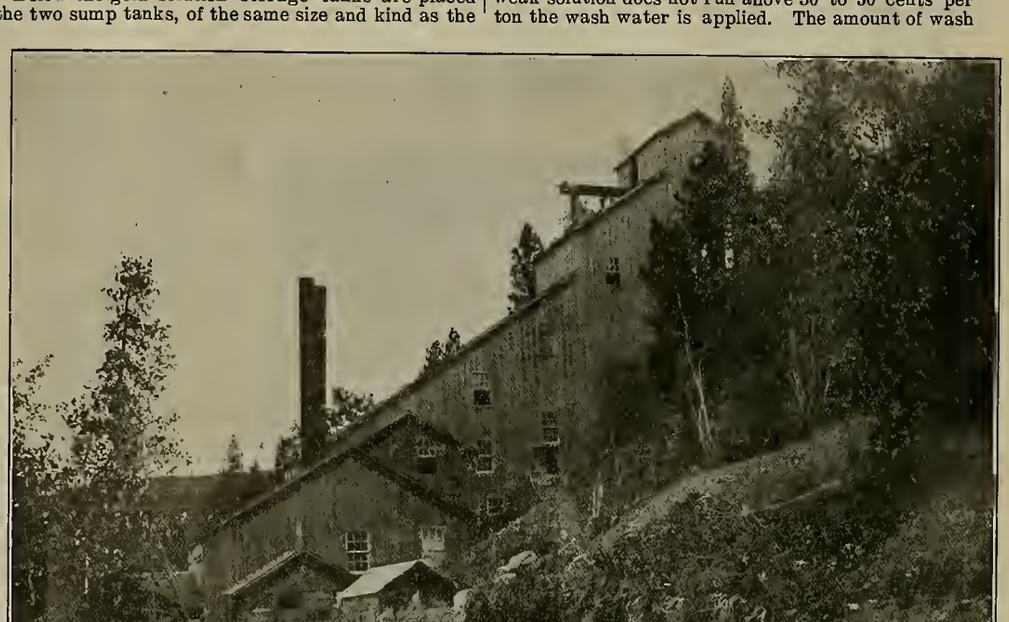
Stationary Inclined Screen: This is 7 feet long, built in two partitions, each 1 foot wide, giving 14 square feet of screening surface. It is inclined at 45°. It is 2-mesh wire cloth, or four openings per square inch.

Combined Shaking and Stationary Inclined Screen: This is the finishing screen. The first 8 feet is a shaking screen and the balance, about 8 feet, being stationary. It is 2 feet wide, giving a screening surface of 32 square feet. It is 2½-mesh. This inclined screen is on the principle of the Berthelet separator, the material passing through it considerably finer than the mesh would indicate. Practically, the product passing through this screen is not above 6-mesh. This is the size of the material cyanided.

THE LEACHING DEPARTMENT OF THE MILL.—There are four leaching vats, 16 feet in diameter and 7 feet deep. The vats are of Oregon fir, 2½-inch staves, bound by seven ⅝-inch iron hoops. The capacity per vat is 55 tons of crushed dry ore. A new wooden 100-ton vat has lately been installed. The vats have a central discharge gate—14x14 inches—discharging the tailings into launders underneath the tanks. The new vat is of larger size.

Below the leaching vats are situated the two gold solution storage tanks, 10 feet in diameter and 6 feet deep, also of Oregon fir, with 2½-inch staves.

Below the gold solution storage tanks are placed the two sump tanks, of the same size and kind as the above. These tanks were used formerly for precipitation tanks, employing zinc dust as a precipitant. This, however, has recently been discontinued.



Wasp No. 2 Mill at Kirk, South Dakota.

The two solution storage tanks are situated above the leaching vats, and are 10 feet in diameter and 10 feet deep, with 2½-inch staves. The main solution pipe lines in the mill are 2½ inches in diameter, each leaching vat being connected, as is customary, with both the strong and weak solution gold storage tanks. There is no vacuum connected with the leaching vats, as the coarseness of the ore permits of rapid leaching and good drainage. As already stated, when the mill began operations precipitation by zinc dust was employed. This, however, was discontinued for reasons discussed farther on, and at present precipitation is carried on in wooden barrels by means of zinc shavings. There are five barrels for the strong solution and six barrels for the weak solution, the barrels being 3 feet deep and 2 feet in diameter at the middle. They are provided with a screen at the bottom, on which the zinc rests, and a rectangular compartment on one side, 8x4 inches, by which solution descends below the screen, rising up through the zinc as in the ordinary form of precipitation boxes. The advantages claimed for the barrels are, first, that the round shape tends to avoid channeling, which causes irregular precipitation, and, second, that the cleanup is much facilitated, because the barrels can be handled individually.

THE CYANIDING OF THE ORES.—The leaching vats are charged by means of a belt conveyor, which takes the ores from the finished product bin and carries it to the five leaching vats. This belt conveyor was installed recently, the mill as originally designed having the vats filled by end dump cars running on tracks over the vats. The conveyor is in two parts, that is, there are practically two conveyors placed at right angles to each other. This is necessitated from the fact that the vats are placed in a row at right angles to the discharge end of the bin. The reader is referred to the diagrammatic sketch for further explanation. The conveyor proper is a 16-inch rubber belt, the first conveyor 50 feet long and the second 40 feet long. The speed of the belt is 600 feet per minute. By these means a vat is charged in from two to two and one-half hours, accomplishing a great saving in time over the old method of charging by cars. The tailings are discharged from the vats by sluicing with a water pressure of 60 to 65 pounds per square inch. The time needed to discharge a vat is two and one-half to three hours. The favorable situation of the mill gives unlimited grade to carry off the tailings.

While the vat is filling, and about one-half full, the strong solution is turned on, 6 pounds of potassium cyanide per ton of solution. The amount of strong solution run on is about 15 tons, which is allowed to stand three to four hours generally, sometimes much longer, according to the nature of the ore. When the strong solution is started draining the weak solution is run on and allowed to remain undisturbed in contact with the ore for at least one hour; then leaching is started, fresh weak solution being continually added to replace that which drains off, until wash water is applied. The weak solution contains 2½ to 3 pounds of cyanide per ton. The amount of weak solution thus brought into contact with this ore is from 40 to 50 tons. When the gold value of the weak solution does not run above 30 to 50 cents per ton the wash water is applied. The amount of wash water is about 6 to 9 tons. The total time consumed is about ninety-six to one hundred hours, including the charging and discharging of the tanks. The total amount of the solution used, including the wash water, is 70 to 75 tons per vat.

The amount of lime used to neutralize the acidity of the ore and give the requisite protective alkalinity to the solution is 6 pounds per ton of ore. This is added unslacked on the cars, before the ore is dumped into the first bin.

The protective alkalinity is afforded by 2½ pounds of lime per ton of solution.

The consumption of cyanide is 0.63 pound per ton of ore, and the actual extraction ranges between 80% and 85% of the values contained in the ore.

THE PRECIPITATION BY ZINC THREAD AND THE CLEANUP.—The precipitation by zinc is practically perfect, but little trouble of any kind being experienced. The rate of flow of both weak and strong solution through the barrels is 3 tons per hour. The tailings solution issuing from the barrels runs from 4 to 10 cents per ton.

The barrels are all provided with a strap on each side, so that they can easily be lifted. When ready for the cleanup the barrels are hoisted up and dumped into one of the gold solution storage tanks, which has been emptied for the purpose. The men get right into the tank and wash the precipitates, taking out all the material that will not pass a 10-mesh screen. This is put back into the barrels. The fine material in the tank is then pumped through a Johnson filter press, having 2x2-foot frames, which was formerly used in the zinc dust precipitation. The precipitates are thoroughly washed in the press and then partly dried by forcing air through the press. Then the precipitates are discharged and are ready for the acid treatment.

A small Worthington duplex pump operates the filter press by water pressure. An air pump can also be connected, so as to force air through the filter press. The precipitates, after the drying, are charged into the acid tank, which is 4x4 feet in cross section and 5 feet deep, lined with heavy sheet lead. It is provided on the inside with several coils of ½-inch lead pipe, carrying steam to heat the acid if necessary. The bottom of the tank has a slight slope toward the discharge opening, a 1-inch lead pipe in the bottom. The acid tank is provided with a close-covered hood, which can be raised and lowered, to facilitate charging. The precipitates are treated with dilute sulphuric acid, of the usual strength, long enough to dissolve the zinc, then allowed to settle and the solution siphoned off. Then water is added and the mixture is pumped back through the filter press. Here it is again thoroughly washed with water, then dried with air. The dried precipitates are then heated to a dull red in sheet iron pans —2x4 feet in size—in a large iron muffle, then

smelted in graphite crucibles with the following flux: Seventy parts crude borax, thirty-five parts soda and twenty parts sand. The consumption of zinc is 0.9 pound per ounce of bullion produced.

THE PRECIPITATION BY ZINC DUST AS FORMERLY CARRIED ON.—As already mentioned, the precipitation by means of zinc dust was carried on in the sump tanks. These tanks for this purpose were provided at the bottom with a perforated circular iron pipe, connected with the air pump. The bottoms of the tanks were inclined ½ inch per foot toward the discharge pipe to insure complete drainage. When the tanks had filled with gold-bearing solution the air was turned on, giving the solution a circular motion, with also ascending and descending currents. The air pressure used was 45 pounds per square inch. Then zinc dust was added in the form of an emulsion around the edge of the tank and the contents of the tank agitated by air for ten minutes. Then the material was pumped through the filter press, leaving some of the zinc dust and precipitates in the bottom. The amount of zinc dust used to start with was 1 pound per ton of solution. This was gradually reduced to ¼ pound for the strong solutions and ½ pound for the weak solutions in succeeding precipitations. It took two hours to pump 12 tons of solution (the amount usually precipitated) through the filter press. The tailings solution from the filter press usually had a value of about 10 cents per ton, showing that precipitation was good.

The objections to the method arose in treating the precipitates taken from the presses. These usually packed very hard, so that it was difficult to disintegrate them for the acid treatment. It was found that the dilute sulphuric acid would attack the dust precipitates but very slightly, it being practically impossible to get the zinc out. This fact may be due to the coating of metallic gold on the zinc particles, protecting them from the acid. At the Golden Gate mill in Utah, and in several other plants where the process is in use, a mixture of sulphuric and nitric acids is used, seemingly with success. Finally the acid treatment was discarded and the zinc precipitates were roasted and then smelted. The usual zinc thread precipitation then replaced the zinc dust precipitation.

METHODS OF SAMPLING ORE, TAILINGS AND SOLUTIONS.—The pulp is sampled at the finished product bin by the following device: The belt of the conveyor has one hole on the center line of the belt, and every time this comes under the discharge spout of the bin some of the pulp shoots through, falling on the apex formed by two slant boards coming together under the center line of the belt. This divides the material into two samples, which are collected on the floor or in large boxes. No information is available as to the accuracy of the sample thus obtained.

Sampling the Tailings: The tailings are sampled by pipe sampler, four samples being taken irregularly distributed over the surface of the vat. After sluicing has commenced a face sample is taken at the center of the vat.

Sampling the Solutions: The solution pipes entering the gold solution storage tanks and leaving the zinc boxes are tapped by a cork and a small rubber tube. No clamp is used, however, and the tube dips to the bottom of a five-gallon stone jar, the overflow going back into the tanks. When the gold solution tank has been filled the solution man dips to the bottom of the jar with a dipper and fills a small bottle, which goes to the assay office. The jar is then emptied and placed for another sample.

THE POWER PLANT OF THE MILL.—Steam is furnished by two Erie return tubular boilers, 75 H. P. The engine is a Sioux Corliss, 12x36-inch cylinder, eighty-five revolutions per minute, steam at 85 pounds per square inch. A separate small upright engine furnishes the power for the conveyor and for the dynamo for electric lighting.

THE NUMBER OF MEN EMPLOYED IN THE MILL.—Day shift: One crusher man, one roll man, one engineer, one tank man, one solution man, one millwright, one superintendent, one assayer; night shift: one roll man (takes rolls and crusher), one engineer, one solution man; total, eleven men. This figure applies while the mill was treating 65 tons per day. Wages for engineers are $3.50 per day, other mill labor $3 per day.

THE COST OF CYANIDING.—The cost of cyaniding is $0.832 per ton, in detail as follows:

Labor	$0.411
Cyanide	.188
Zinc	.031
Repairs	.086
Fuel	.116
Total	$0.832

The figure stated was for the month of October, 1901, when 3294 tons were treated, making a daily average of 106 tons.

A TON OF CALCIUM CARBIDE requires 4500 kilowatt-hours of energy for its manufacture and gives 10,000 cubic feet of acetylene. In burning, this gas gives out 250,000 candle-hours of light. The same amount of energy would produce 1,440,000 candle-hours if consumed in incandescent lamps, about twice as much if used in Nernst lamps, and nearly 5,000,000 candle-hours if used in working open-arc lamps.

The Holthoff Machinery Company.

The Holthoff Machinery Company, recently organized in Milwaukee, Wisconsin, for the manufacture of mining and metallurgical machinery, has its new plant about ready for operation. The works are located at Cudahy, a suburb of Milwaukee.

The officers are W. D. Gray, president; H. C. Holthoff, vice-president, and B. T. Leuzarder, secretary and treasurer, all of whom are well known to the public by reason of their long association with the E. P. Allis Co., and who resigned shortly after the company was taken over by the Allis-Chalmers Co.

Holthoff Machinery Co.'s Works, Cudahy, Wis.

The new works, as illustrated herewith, consist of a boiler and sheet metal shop, 250x100 feet; a machine shop, 250x110 feet; a pattern shop, 120x60 feet; with a two-story office building, 80x32 feet. Provision is also made for a foundry, 250x100 feet, which will be erected in a very short time. The other buildings are nearly completed, and the company will occupy its new offices by April 1st. It is expected the entire plant will be in operation May 15th. The shops are equipped with the best machinery which can be purchased, and it is the purpose of the company to manufacture a full line of mining and metallurgical machinery, including stamp mills, chlorination mills, cyanide mills, concentrating mills, silver-lead and copper furnaces, converters, smelters, copper bessemerizing plants, transmission machinery and mine equipment, together with boilers and all kinds of heavy sheet metal work. With the long experience which these gentlemen have had in this line of business and with a new plant equipped with every modern convenience for doing work quickly and economically, the company should be able to obtain its share of the business in sight.

Mr. Gray was at the head of the flour mill department of the E. P. Allis Co. for about twenty-five years and has engineered the construction of many of the large milling plants in the United States.

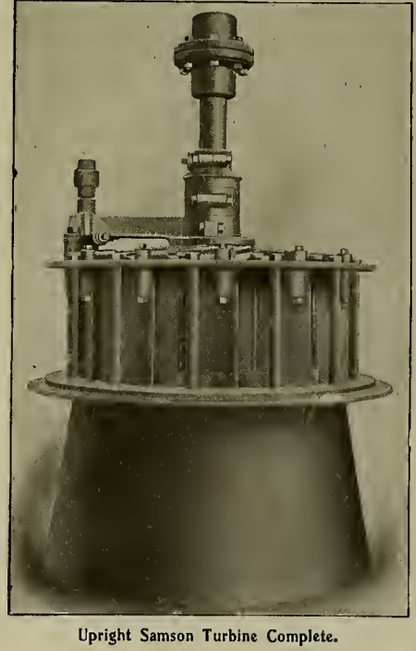
Mr. Holthoff has had an experience of some twenty-two years in connection with mining and mining machinery. For fifteen years he has followed the business of mining and mechanical engineer in the mining regions of the West, designing and superintending the construction of mining and metallurgical plants, and is well known throughout the mining world. He was with the E. P. Allis Co. as chief engineer of their mining machinery department for some seven years, designing and supervising the constructing of machinery built by them in that line.

Mr. Leuzarder was with the E. P. Allis Co. seventeen years, and for the last fourteen years of that period was at the head of their accounting department. When the Allis-Chalmers Co. was organized, he was elected comptroller of the company, which position he resigned to organize and associate himself with the new enterprise.

AT the Striberg mine in Sweden the ore is a rich hematite, containing 60.44% of iron, associated with poorer ore containing 51% of iron. The gangue consists of quartz, epidote, chlorite and mica. Dressing plant of a very elaborate character, driven by electricity, has been erected, and in the period from May to November, 1901, about 11,000 tons of crude ore were treated. On an average 100 tons were treated a day, yielding 60 tons of concentrated ore, of which 17% was picked ore of more than 20 millimeters in size; 40% was coarse jigged ore of 20 to 5 millimeters; 15% was medium jigged ore of 5 to 1 millimeter; and 28% was fine jigged ore of less than 1 millimeter. On analysis these classes of ore yielded the following percentages: Picked ore, 59.01 iron, 0.048 phosphorus, 0.008 sulphur; coarse, 62.21 iron, 0.033 phosphorus, 0.008 sulphur; medium, 62 65 iron, 0.033 phosphorus, 0.015 sulphur; fine, 65.68 iron, 0.018 phosphorus, 0.034 sulphur. In all, at the concentrating works fifteen men are employed. The cost of installation was 160,000 kronor. The cost per ton of ore obtained is 5 kronor.

Samson Turbine and Cascade Water Wheels.

Herewith are illustrated the latest and best types of Samson turbine and Cascade water wheels as manufactured by The James Leffel & Co. of Springfield, Ohio. The forty years' constant practice that this company has had in the water wheel line, frequently under the most difficult circumstances, has given them the opportunity to understand the qualities necessary to meet successfully, under all conditions, the



Upright Samson Turbine Complete.

present exacting requirements of a water wheel plant. In the Samson wheel the double wheel feature has been retained. The easily operated balanced gates have also been preserved, qualities supplemented by the addition of the double diameter feature, the outward discharge element and other improvements for which letters patent have been

Five Nozzle Cascade Wheel.

granted in this and other countries. The Samson turhines are huilt on hoth upright and horizontal shafts in a great variety of styles. These are frequently of special designs and capacities to conform them to unusual and complex conditions.

The Cascade water wheel is illustrated herewith. There are no wearing parts except the journals of the shaft, which indicates durahility and a minimum of cost or expense for repair. Any ruhhing and consequent wearing of the metal surfaces, causing leakage where close and neat fits are necessary, is said to he ohviated in the Cascade wheel. Harron, Rickard & McCone, 21–23 Fremout street, San Francisco, have heen appointed Pacific coast agents for this line and will he pleased to furnish catalogues and information regarding the styles of wheels shown ahove, or regarding the standard and special wheels of this manufacture.

Boiler Scale Solvents.

By D. B. Dixon.

A boiler free from scale and corrosion is greatly desired hy all engineers, hut is a very difficult thing to attain in practice. Boiler feed water is never found chemically pure, always containing foreign suhstances in solution and when hoiled until it all escapes as steam. We find on the hottom, sides and tuhes of the hoiler a coating or deposit, which, if hard, we call incrustation or scale; if in the form of a powder, we call it sediment. The water also holds mineral matter in a state of mechanical suspension. Incrustations are injurious to hoilers hecause they are poor conductors; cause loss of heat and waste of fuel estimated from 15% to 40% of the fuel used, dependent upon thickness of the scale; cause over-heating of the hoiler plates, which is sure, sooner or later, to hurn out the meal, and may result in an explosion of the hoiler; and corrosion of the metal occurs rapidly in parts of the boiler upon which the deposits are more liahle to accumulate. Incrustations due to the deposition of matter held in solution in the water have only heen spoken of, as those are by far the most frequent. But it is known that a quantity of fatty matter in the feed water of a hoiler causes a deposit, and that this may lead to the destruction of the hoiler, inasmuch as the part of the hoiler shell under the incrustation hecomes more heated than other parts and is apt to occasion rupture. Cases have come under the notice of boiler inspectors where oil, used to luhricate the cylinders, has heen carried into the hoilers with the feed water, and settling upon the furnace crowns formed a thin, hard incrustation, which resulted in burning the plates, followed by a crack necessitating repairs.

The best means to prevent incrustation is the purification of the water, or the removal of the incrustants before the water enters the hoiler. In order to ascertain whether and how a certain feed water can he purified to the best advantage, it is necessary to have a sample of it analyzed. The sample should he put in a clean new jug and not he less than one gallon. There are certain things that may he done to prevent rapid scale formation in boilers located almost anywhere. That no scale will form is not to be inferred, but that the formation will be very much slower than if nothing is done to prevent it at all. When a new boiler is installed it is too often run without any move heing made to prevent the formation of scale, and this continues until it is seen on the tuhes and plates. Then a decided move is made, but usually it is too late, for the methods adopted are too mild to cope with scale forming on the scaled surface. If a hoiler is taken in time and before the scale has accumulated to any appreciable extent—whether the hoiler has just been thoroughly cleaned or is new does not make any difference—and a surface and hottom hlow-off are opened several times a day, it will he found that the formation of hard scale will take place much more slowly. Even when the water is very bad, a good surface blow-off device properly placed in the hoiler will prevent scale formation. There are many compounds on the market for preventing incrustation: some are very costly, and few of them are alike applicahle to all cases. Some of them increase corrosion of the hoilers while they prevent incrustation, and in the employment of others practical difficulties arise which render their use inconvenient and even dangerous. Slah zinc is often used in boilers and hot water tanks to prevent scale formation and the corrosive action of the water on the metal of which the tank or boiler is composed. The action appears to he an electrical one, the iron heing one pole of the hattery and the zinc heing the other. Under the action of the current of electricity so produced, the water in the tank is slowly decomposed into its elements, oxygen and hydrogen. The hydrogen is deposited on the iron shell, where it remains. It will not unite with iron to form a new compound, hut if any iron rust is present it will remove the oxygen from this and deposit the metallic iron on the plates. The oxygen of the water that is decomposed, instead of going to the iron, goes to the zinc and forms oxide of zinc, and in the course of time the zinc will be found to he almost entirely converted into oxide. On account of the action outlined, it is generally helieved that zinc is always a good thing to prevent both scale and corrosion, and that it cannot be harmful to the boiler under any circumstances. But such is not always the case, and in making use of zinc the boiler should he frequently opened and the action carefully watched, so that if any undesirable effects show themselves they may be checked in time to prevent serious trouble. Carbonate of soda is used to a very great extent as an "anti-incrustator," and it also prevents "pitting." A simple way of adding the soda is to dissolve it in the feed water prior to its injection into the hoiler. A sufficient quantity will have heen added in all cases where the water (sampled at the gauge glass top) will turn a piece of red litmus paper slightly blue, showing that the water is slightly alkaline. A very simple method of removing the incrustation of hoilers is said to have been discovered hy a French engineer. After extinguishing the fires the hoiler water is hlown off very gradually, at the same time admitting an equal volume of cold water, so that the water gauge shows no charge of level. As soon as the water has in this manner been sufficiently cooled down it is suddenly hlown off. This latter operation is said to remove the major part of any incrustation which may he present, what remains heing very easily detached hy scraping. The cleaning of the boiler must, however, be taken in hand immediately upon completion of the hlowing-off operation, as otherwise the furstone will harden and adhere again to the boiler plates.

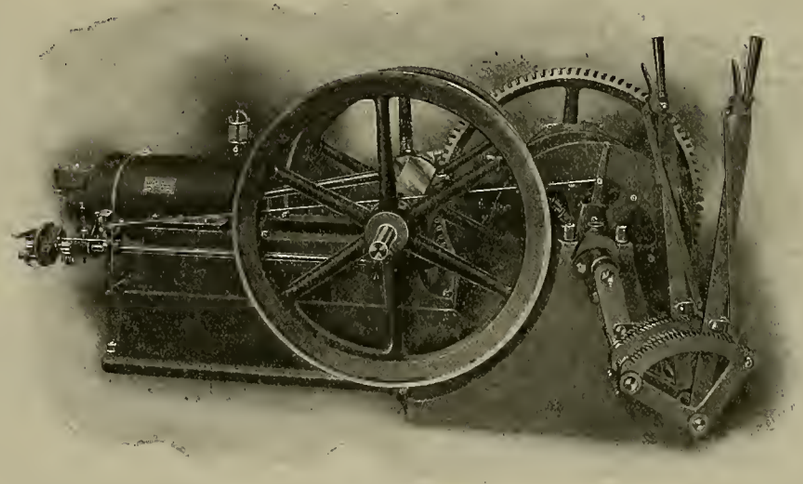
Kerosene oil possesses properties which make it useful in removing old scale from the shell and tuhes of a steam hoiler, and it is extensively used for this purpose. But, unfortunately, it is not always applied judiciously, hence the many failures attending its use. It can also be used to prevent the formation of scale. We have seen wheelharrow loads of scale loosened from the shell and tuhes of a hoiler during a week's run, after kerosene oil had heen applied. Three treatments with kerosene oil during three weeks' time left all parts of the interior of the boiler "metallically clean." The greatest difficulty experienced in the successful use of kerosene oil for removing scale is that the quantity usually applied is too small to he of perceptihle henefit. Kerosene oil is highly penetrative, and it will penetrate through a considerahle thickness of any porous suhstance—especially boiler scale. Ordinary kerosene oil will wholly evaporate if kept at a temperature of ahout 200°. For this reason it is of little henefit if fed into a hoiler where the temperature is higher than this, hecause it will soon evaporate; while it remains it will rest on the surface of the water—very little being carried below the surface hy the circulation of the water. To make kerosene oil effectual in removing scale from the inside of a hoiler, from a feed water heater, or other place where scale has accumulated, it should be applied in liheral doses and at a time when the hoiler, heater, or other device is comparatively cold. In using kerosene oil for removing old scale from a boiler, it must he used with some judgment, else the loosened scale will gather on the fire sheet, or between the tuhes, and injurious effects may result. When the scaled hoiler is open and dry the kerosene oil may be applied to the extent of a gallon or so to the lower rows of tubes, using a syringe for the purpose. If the scale is thick and porous it will readily ahsorh the oil—if the scale is dense and close grained more time should be allowed for the oil to penetrate. After a sufficient quantity of the oil has heen introduced the boiler should be closed up, filled and run for ahout a week, then opened and the loose scale cleaned out. Another application of oil should then be made and the same process gone through with. This method will effectually clean the scale from a hoiler in the course of a very few weeks.

Another way of applying the oil has heen used to good advantage. When the hoiler is empty put into it ahout a hucketful of kerosene oil, then let the hoiler fill very slowly. The oil will float on top of the water and he absorhed by the scale as they come in contact, until all the oil is absorbed. In this way the oil can be applied in greatest quantity to the scale which is nearest to the bottom of the hoiler. A few such applications will effectually loose all the scale. Kerosene oil acts for this purpose, hy reason of its penetrative power, working through the scale until it comes in contact with the iron, thus overcoming the adhesion between the scale and metal. When heat is applied to the hoiler the oil soon hegins to evaporate, and hy its expansive force further loosens the scale and forms cracks in it, through which the water enters until it reaches the metal, after which the force of the steam further assists in breaking up and removing the scale, which will fall off in chunks, leaving the tubes and shell metallically clean where the hreaking up process has taken place.

An ahsolutely clean surface inside of a hoiler is not desirable. A thin incrustation not thicker than an egg shell, near the firing, is not injurious. It is frequently of henefit even, as it protects the boiler shell and tubes from the influence of injurious components of the feed water. But after all has heen said as to the merits of the various hoiler scale solvents and preventers, the only sure, satisfactory and rational course to pursue is to have the feed water analyzed and a physic made to suit its requirements. Any and all solvents—with the exception of kerosene oil—should he introduced gradually and continuously with the feed water. Usually, all that takes place when a compound is doing what it is supposed to do, is that the scale or deposit is rendered soft and comparatively easy to remove. The hoiler requires regular cleaning and scaling just as if no compound were used. This is not always done, however, for it is thought by some that when a compound is used all the work on the part of the engineer or fireman in removing the scale and keeping the hoiler clean is heing amply accomplished hy the compound.—American Manufacturer.

Improved Witte Gasoline Hoist.

The cut herewith is an illustration of the improved Witte gasoline hoist, which has given satisfaction where introduced as a practical, reliahle and substantial machine. The manufacturers state that the Witte is the simplest successful gasoline engine built. Gearing on the crank shaft revolves a shaft, extending the length of the engine, on which are placed the ignitor trip, cams to operate the exhaust and gasoline valves and the governor. A heavy suhhase of neat design extends in front to carry the drum, which is operated hy a powerful friction clutch. A heavy wood-lined hand brake is provided, and an ingenious speed regulator permits the load to he started slowly, without jerk on the cahle. The engine runs slowly at all times when not hoisting, except when otherwise desired.



Witte Gasoline Hoist.

Witte engines are in use to-day for hoisting, air compressing or pumping where coal can he delivered at the mine for $3 per ton and gasoline costs 18 to 20 cents per gallon. This preference is claimed to be due to successful experience, demonstrating that a reliahle gasoline engine properly installed is more efficient than steam, easier handled and calls for no expense account for repairs and maintenance.

Witte hoists are built in sizes from 4 H. P. to 100 H. P., single or douhle drums, and speed and load arranged to suit customers.

The Tracy Engineering Co. of San Francisco, Cal., manufacturers' agents for the Witte gasoline engines and hoists, will furnish those interested with detailed information relating to their installation and operation.

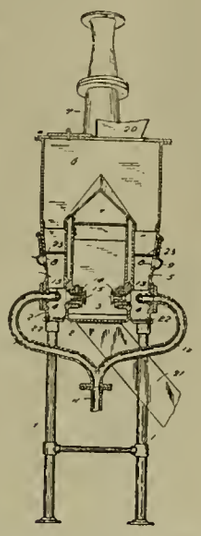
The total numher of stationary boilers in use in the United States, as enumerated in the census of 1880, was 72,304. It has heen estimated that on Dec. 31, 1890, there were approximately 100,000 stationary boilers in use, and the estimate is made that at present there are about 170,000 hoilers under insurance.

Mining and Metallurgical Patents.

Patents Issued April 15, 1902.

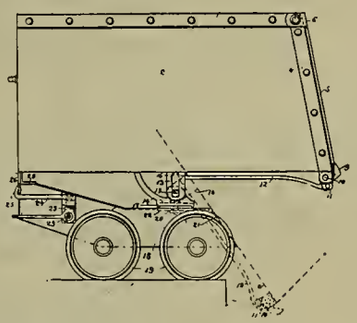
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

ROCK PULVERIZER.—No. 697,505; H. Luckenhach, Seattle, Wash.



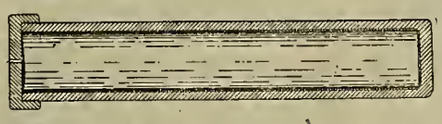
Central chamher, wing compartments, oppositely disposed nozzles discharging contents of wing compartments into central chamber, each wing compartment having opening above nozzle and pocket heneath nozzle and covers for openings provided with perforations in upper parts.

AUTOMATIC DUMPING ORE CAR.—No. 697,685; C. H. Snow, San Francisco, Cal.



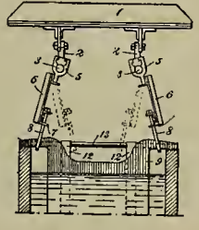
Wheeled truck having two memhers of turntahle carried thereon, upper member having upturned sides, trunnions projecting from sides, car hody having supports extending downwardly from hottom and turnahle upon trunnions, upwardly arched central portion of trunnion shaft having one end of rod turnahly connected therewith, hinged automatically closing door at end of car hody, pivoted latch adapted to engage bottom of door and having downwardly projecting arm and connection between arm and opposite end of rod whereby tilting of car unlatches door.

APPARATUS FOR ASSAYING ORES.—No. 697,774; W. T. Armstrong, San Jose, Cal.



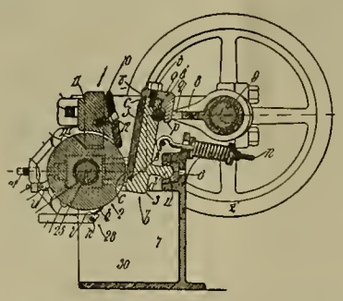
Receptacle having suitahle closure, an ore-containing envelope or cupel of fibrous material adapted to he inserted into it, whereby ore is prevented from coming in contact with sides of it during process of reduction.

METALLURGICAL CRANE.—No. 697,788; D. W. Blair, Perth Amboy, N. J.



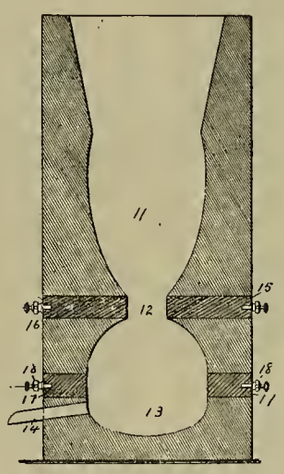
Metallurgical crane, comprising frame to he located over metallurgical hath having anodes and cathodes disposed alternately, plurality of shafts mounted upon frame and plurality of L-shaped hooks connected with shaft, all hooks of each shaft heing disposed in same plane and normally having hills turned in same direction, hooks being free to rock in planes extending across hath, and also free to travel in general longitudinal direction of hath; arrangement heing such that hooks are free to simultaneously engage all anodes, or to simultaneously engage all cathodes.

ORE CRUSHER.—No. 697,802; A. C. Calkins, Los Angeles, Cal.



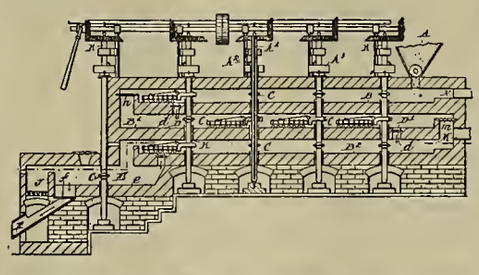
Frame; eccentric shaft mounted in frame; vihratory jaw provided with seat for face plate and having at lower end lip to retain face plate in seat and heing provided at upper rear side with socket for connecting rod; wearing face plate seated in seat; connecting rod mounted on eccentric of shaft and socketing in socket and provided with opening, rearward of socket; clamp piece for top of hody of vibratory jaw and provided at front with lip to extend in front of face plate and provided at rear with finger to extend through opening in connecting rod to hold end of connecting rod in socket; and means for fastening clamp memher to upper end of hody.

ELECTRIC FURNACE.—No. 697,810; M. R. Conley, New York, N. Y.



Body portion made of refractory non-conducting materials and formed with main inner chamher, neck at hottom of inner chamher, hearth helow neck, heating zone forming wall of neck and made up of series of plates or parts adapted to be heated to incandescence hy passage of electric current through them, and second heating zone in hearth formed also of plates or parts which are adapted to he suhstantially flush with furnace wall and incandescence under influence of strong electric current.

ORE ROASTING FURNACE.—No. 697,863; T. D. Merton, Spottiswoode, Victoria, Australia.



Plurality of superposed communicating hearths, series of hollow vertical shafts passing through hearths, water supply pipe having series of depending hranches corresponding in numher with and located in respective shafts, driving shaft common to all and operatively connected with shafts, arms extending radially from shafts, means for connecting arms rigidly yet removahly to shafts, bars connected to arms, rabbling shoes detachahly depending from bars, notched lugs extending from arms, and stay rods connected to bars and having eyes to engage notched lugs.

METHOD OF RECOVERING METALS BY ELECTROLYSIS.—No. 697,831; H. A. Frasch, Hamilton, Canada.

Process of recovering nickel hy electrolysis, consisting in supplying cathode with solution of nickel-ammonium chloride containing excess of ammonia, and supplying soluhle anode consisting of different metals with solution of sodium chloride, separating two solutions hy horizontal permeahle diaphragm, and by electric current precipitating nickel in metallic form upon cathode, forming at anode solution of chlorides of various metals contained in anode, displacing chloride solution from helow diaphragm hy addition of fresh sodium chloride solution, and further electrolyzing cathode solution until last trace of nickel has heen removed from cathode electrolyte, and utilizing remaining solution of free ammonia for production of fresh nickel-ammonium chloride.

PROCESS OF TREATING COPPER-NICKEL SULPHIDE ORES.—No. 697,370; D. P. Shuler, Sudhury, Canada.

Treating ores containing nickel-iron sulphides with copper-iron sulphides, hy suhjecting comminuted ore to magnetic separation so as to produce headings and tailings, headings being richer in iron and sulphur than tailings, hut generally poorer in nickel; thus hringing about, by magnetic separation, variation or readjustment of relative proportions of iron and nickel, so as to produce proportions which are proper for making of nickel-steel, then roasting headings, and finally smelting them to produce pig-iron containing proportion of nickel which makes it suitahle for direct manufacture of nickel-steel.

PROCESS OF PURIFYING ZINC BEARING ORES.—No. 697,898; C. R. P. Steinau, Cleveland, Ohio.

Process of purifying zinc bearing solutions containing hydrochloric acid, iron, manganese, cobalt, nickel, copper, lead, arsenic, cadmium or other metals kindred with zinc, which consists in treating solutions with zinc powder, to precipitate those metals which are kindred with zinc, then removing any iron and manganese that may he contained in solutions, then treating latter with hydrate of an alkali and with hydrochlorite of same alkali, to remove part of cohalt and nickel, and, lastly, again treating partly purified solution with zinc powder, to precipitate remainder of cohalt and nickel.

RECENTLY a factory has heen built at Stangfjorden, in Norway, for the electric treatment of peat by the Jebsen process. According to a description given hy the Zeitschrift fur Electrochemie, the peat is first submitted to air drying, and is pressed until the water contents are reduced to 20% or under. It is then charged into retorts of special design, heated internally by electric resistance coils. A gas useful for heating purposes, and a tarry oil, distill over, while a very pure form of peat, charcoal or coke remains in the retorts. The tarry oil can he worked up for the recovery of paraffin, ammonium sulphate and methylalcohol. The electric plant at Stangfjorden consists of five 128 H. P. turhines and five dynamos of equivalent power. A daily treatment of 100 metric tons of air-dried peat is possible with this plant in the twelve retorts which are at present installed.

A WIRE ROPE needs a lubricant that will penetrate all the wires, and, as a preservative, it must be free from acids and prevent rust. A good lubricant is made of tar, summer oil and mica axle grease, in varying proportions to suit varying conditions.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

President Roosevelt has designated Juneau as the location for the Alaska land office and the office of the United States Surveyor General for Alaska, removing it from Sitka.

ARIZONA.

COCHISE COUNTY.

The new Copper Queen smelter at Douglas is to he controlled by a separate corporation, to be known as the Douglas Reduction Works, which suggests the belief that the works will constitute the central reduction plant of the Phelps–Dodge interests in the Southwest. The smelter is to he 235x150 feet, the power house 270x100 feet, and the boiler house 200x40 feet. All these structures will have railroad tracks running within them. The machine shop, blacksmith shop and foundry will he built at once, and are now under way. The ores received hy railroad will he handled in a novel manner. They will be mixed in pits, instead of at the furnace mouth, as usual. There will he no ore bins, hut instead three pits, 38x100 feet in size, excavated 12 feet deep by steam shovels. The three pits will lie parallel to each other, will be lined with concrete, and will have a capacity of nearly 100,000 tons of ore. In each of the pits will he a traveling steam shovel that will hoist the mixed ore into cars on trestles 18 feet ahove. At the smelter the ore supply tracks will he 50 feet in height, and thence the main work of handling the charges will be by gravity.

At a meeting of stockholders of the South Bishee Co., forty-six mining claims near the Copper Queen property at Bishee were sold to G. R. Camphell of Calumet, Mich., for $1,200,000—$150,000 in cash and the balance within two years.

MARICOPA COUNTY.

The Oro Grande mine, near Wickenhurg, has let a contract to N. Garcia to sink the 3-compartment working shaft. Three shifts are heing worked on the new shaft, which will he the permanent working shaft, and the mill will be erected hetween it and the workings farther down the hill. When sufficient depth is attained a large douhle drum hoist will he installed.

The Buckhorn M. Co., of which G. D. Gray is president, is engaged in huilding a new wagon road from their mine to Wickenhurg, which will be 4 miles shorter than the old road.

The sale of four groups of mines near Wickenburg to T. E Otis and associates of New York for $1,000,000 is reported. The claims include four developed mines and ahout forty claims and prospects in the Picacho Blanco district. The Exposition mine and surrounding claims, together with the claims of W. B. Troy of New York and the Trilhy and White Cloud mines of the San Domingo group, make up the purchase.

MOHAVE COUNTY.

A rich strike has been made 12 miles south of Peach Springs of ore found in the contact between the slate and granite, running 30% in copper and $130 in gold to the ton. There are ten claims in the group, all carrying free gold. One claim shows a 3-foot ledge carrying $20 in gold and 30% copper. The owners are W. Tucker of Ash Fork, W. Crowell, J. M. Little and D. M. Alexander of Williams.

Ground is heing broken and grading done for the Vulcan smelter at Chloride. It is expected to have the plant in operation by the first of June. The company has let a contract to F. W. Theis to develop for them all the water they may need for the plant.

PIMA COUNTY.

H. R. Bacon, Supt. of the Oceanic gold mine, near Tucson, says it is now ready for a stamp mill, and Mr. Wores, the owner, is preparing to place one upon the property at once.

SANTA CRUZ COUNTY.

J. W. Milligan and J. M. Douglas, who in December located the Old Kentuck claim, near Washington, have sunk a shaft 35 feet deep and struck an ore body 3 feet wide, carrying gold, silver and lead. They bonded it at $25,000.

YAVAPAI COUNTY.

H. E. Armitage is about to start up work on the Hercules property, located 10 miles from Hot Springs Junction, and will make extensive exploration of the ore bodies with a diamond drill.

Moynahan & Co. are preparing to place a 10-stamp mill on the Home Run mine, Groom creek, about 7 miles south of Prescott.

The site for the 300-ton smelter of the Del Rio Smelter Co. at Del Rio is being laid out and construction is to begin soon.

Supt. Pickerell says the shaft on the President mine, near Prescott, is now down 425 feet and work is heing pushed hy three shifts.

Baker & Bowers, owners of the Starlight mine, hetween Prescott and Jerome, have a shaft down on the property 150 feet and will put in machinery to sink deeper.

The Myrtle M. Co., operating a group of claims on Ash creek, near Prescott, are putting up bunk houses and other necessary huildings, and propose to soon put on from twenty to twenty-five miners.

E. D. Treadwell has commenced work on the erection of the smelter for the G. A. Treadwell M. Co., at Mayer, and is putting in a water supply pipe line from Wolf creek.

CALIFORNIA.

AMADOR COUNTY.

F. Giannini and associates are sinking a shaft on the Giannini property in Drytown, on what is called the west vein. The shaft is down 40 feet in a ledge 4 to 5 feet wide of rock that prospects $5 to the ton in free gold. The ore is heavily sulphuretted.

F. Drew has honded the talc vein west of Drytown and is making a test of the rock. It is claimed to show at least $3 to the ton on the plates.

CALAVERAS COUNTY.

The new gallows frame at the Gwin mine, near Palorma, will he of steel and 100 feet high. This will he the first steel gallows frame to he erected along the mother lode, and the highest one, exceeding that of the Oneida at Sutter Creek, which is 80 feet high. Besides the twenty stamps to be added to the eighty now installed, there will he a sampling mill through which samples from the face of the drift will be run daily.

At the Easyz Bird mine, near Mokelumne Hill, huildings have heen erected and the work of developing the mine is going ahead. The vein is from 4 to 8 feet in width in good milling ore between well defined walls.

New machinery is arriving at the Fanny Marie mine at Glencoe. Under ground an upraise of 40 feet has heen run on a 3-foot vein of good ore.

J. Maltman and I. A. Ryant are opening up the Pioneer mine at Angels. The 55-foot shaft is being cleaned out and retimbered. A horse whim is used for hoisting, and a 5-inch plunger pump operated hy a 16-foot overshot water wheel for pumping.

EL DORADO COUNTY.

H. G. Koppikus is having a test run made on ore from the Clipper quartz mine at Georgetown.

LOS ANGELES COUNTY.

The Blast Furnace Smelting Co. has been incorporated at Los Angeles with S. L. Kistler, F. B. Pittingill, E. Nicholson, J. E. Eichelberger and L. F. Kistler directors, and capital $1,000,000. The company is to estahlish a smelter in the vicinity of Los Angeles.

MADERA COUNTY.

The Western Iron & Steel Co., capital $15,000,000, has heen incorporated at Phœnix, Ariz. The directors are B. F. Brening, M. Pollasky, J. H. Bridges, W. G. Bussey, H. W. Hodge, I. C. Stump, J. W. Stanford, S. P. Thomas, A. E. Pierkowski. The principal office is in San Francisco and the iron mines it proposes to exploit are in Madera county. The blast furnaces are to he built on San Francisco bay.

NEVADA COUNTY.

The Remington Hill drift mine, near Nevada City, F. A. Gourley Supt., has heen started up. The owners intend to sink a shaft for the channel and will install hoisting and pumping machinery.

PLACER COUNTY.

The Bloomer M. Co. has struck some rich pay ore in their claim in Dutch ravine, near Newcastle. The main shaft is now down 200 feet and the find is in the 130-foot level. The mine is owned hy F. E. Brye, A. L. Smith and G. L. Threlkel of Auhurn, the latter being the Supt.

SACRAMENTO COUNTY.

It is claimed there will he at least five new gravel mines in operation near Folsom in addition to the Blue Ravine and Gray Wing mines that are now running. There is now a strip of country ahout 2½ miles in length which is supposed to he on the same channel as the two noted, every acre of which is under bond hy mining companies, some of which are operating and others making preparations to.

SHASTA COUNTY.

O. L. Jezler of Redding has struck a ledge of gold-bearing quartz at the hottom of a well he is sinking in that place. The well is to he turned into a mine.

The fire in the sulphide ore hodies of the Iron mountain mines, from which the Keswick smelter gets its supply, is again gaining ground. The fire started eighteen months ago. Since active work was hegun six weeks ago two levels, important sources of ore supply, have had to be abandoned on account of the fire and the drifts sealed up. The remaining levels are hot.

The Eastern owners of the Balaklala copper mine at Kennet are making a thorough examination of the mine property with a view of erecting a smelting plant having a daily capacity of 2000 tons. The borings with diamond drills at the mine show, it is stated, the existence of 10% to 12% copper ore, averaging gold and silver values of $12 to $14 per ton in large quantity.

H. C. Woodrow, Supt. of the Texas mine at Whitehouse, says the mine is temporarily closed hecause the Mountain Copper Co. refuses to accept any more low-grade ore, which constitutes the hulk of the mine's output. The Texas for sixteen days during March yielded 800 tons, and is capahle of landing 2000 tons a month at the smelters. The property is shut down simply because the ore cannot be reduced until the company can install its own plant.

A 5-inch ledge of 28% ore discovered at Whitehouse has widened out to 12 feet of ahout 16% ore carrying $5 gold a ton. The showing of copper was unexpected, as the miners were looking for gold quartz.

The tunnel of the South Fork M. & Dev. Co. at Chicago mountain, near Igo, now in 1500 feet, is to he extended 1000 feet. B. F. Rogers is Supt. He states that it is the intention of the company to build a smelter if the rock is encountered in paying quantity.

A matte smelter is to be located near the town of Copley on the railroad ahout 12 miles north of Redding. J. J. Chambers of Redding owns a piece of mining property adjoining the town, on which an Eastern company is proposing to put in a 100-ton copper smelter, to he gradually enlarged to work 500 tons daily.

SIERRA COUNTY.

The people who honded the Mabel mine, near Forest, have extended the main tunnel and sunk a shaft 40 feet to bedrock. A fine body of gravel was exposed and a good prospect of gold taken out, but the poor facilities for handling water stopped work in the shaft. They have incorporated as the Mahel Mertz G. G. M. Co., with F. M. Sponogle as president and W. W. Barham secretary, with office in San Francisco. Operations are to he resumed at the mine and a new tunnel will he run.

SISKIYOU COUNTY.

(Special Correspondence).—At the Pine Grove placer mine on the Klamath river, owned by H. J. Barton of Oak Bar, and bonded to M. J. Whitney & Co., a Detroit company, the latter have reached bedrock with their elevator and have found gravel that prospects from $2 to $3 to the pan, and from $10 to $20 to the pan is obtained on hedrock. From four days' work with four men $375 has heen taken out without cleaning hedrock.

Oak Bar, April 18.

At the New York mine on Indian creek, near Yreka, J. B. Scott manager, a fine hody of ore, very rich in free gold, has heen struck. The vein is from 15 inches to 3 feet wide. On this property there is 4000 feet of tunnel work. The new stamp mill has heen started up.

San Francisco people have bonded at $20,000 the Yellow Jacket mine, on Indian creek, near Oro Fino, from Goodfellow & Henderson. It is a porphyry dike, 40 feet wide.

At the Minetti B mine at Nolton, which is heing operated hy White & Martin, $23.85 was recently taken from a single pan of gravel taken from hedrock.

Six dollars to the pan has heen obtained on hedrock on the Tom Quigley claim, on the Klamath river, at the mouth of Beaver creek, near Oak Bar.

G. W. Tyrer of the Tyrer M. Co., near Klamathon, is developing a quartz proposition on which ahout 1200 feet of development work has heen done. A shaft will be sunk on the ledge soon. They have a new 10-stamp mill on the property.

A rich strike has heen made at the Golden Eagle mine, on Indian creek, near Oro Fino, owned by A. C. Brokaw & Co. The ledge is a foot wide and the rock goes ahout $100 a ton.

D. B. McDaniel of Ashland, Or., has started work on his quartz properties, near Coles.

Coleman & Starkey have commenced work on their contract, digging 3 miles of ditch for the Espey mine, on Hungry creek, near Coles.

TRINITY COUNTY.

G W. Payne, manager of the Alta Bert Dredging Co., operating a dredger at Trinity Center, is preparing to install new dredging machinery, etc., for the dredger of a heavier character than that now used. As soon as the new machinery is installed the dredger will run night and day. The gravel on the ranch is from 15 to 30 feet deep.

The water in East Weaver creek has been turned into the Sweepstake mine ditch, the pipe line across the hreak at the head of Garden gulch having heen completed. The giants at the mine are running and everything is working satisfactorily.

It is reported that a San Francisco company has bonded the Graves ranch at Trinity Center for gold dredging, and are arranging to prospect it. The driller for prospecting the ground is now on the way there. If the prospects are satisfactory the ranch will he bought and a dredger placed upon the ground.

At the Texas Jack mine, near Trinity Center, three tunnels have been run and the lead exposed in the first two. There is a large amount of free milling ore on the dump which is claimed to average from $26 to $40 a ton.

At the Oriole a drift has been run in 75 feet on the ledge and an upraise made to the surface The vein averages about 20 inches and the ore is free milling. There is ahout eight tons of ore out said to average $200 a ton, and ahout seventy tons of ore that will go about $15 a ton.

The Altoona Quicksilver M. Co. has fifteen men at work on the Fairview mine, near Minersville, under J. H. Porter, manager. Three tunnels have been run and the lead opened up in several places on the surface. No. 1 tunnel has heen run on the lead about 100 feet and shows a well defined vein, which averages 3 feet in width and ahout $10 per ton in gold free milling. The face of this drift is ahout 100 feet below the apex of the lead. No. 2 tunnel runs on the lead 375 feet. The lead in this tunnel is also about 3 feet wide and averages $10 in gold. No. 3, the lower tunnel, is in 360 feet, and it is helieved will cut the ledge within the next 50 feet.

C. and J. Ruggles have uncovered a large body of rich ore in their mine near Carrville that carries gold to the extent of $1800 per ton. Just across the Trinity river from the Ruggles claim, Blagrave, Stoddard & Cooper have discovered ore just as rich.

TUOLUMNE COUNTY.

The Gladys M. Co., operating near Coulterville, has bought a new hoist. H. S. Weaver is president and A. W. McQueen is secretary, hoth of San Francisco.

T. Donohue, foreman of the dredging company at La Grange, says a steam power prospecting drill is being set up under H. Cornish of Oroville. These drills bore holes 6 inches in diameter. Two more are to be installed.

A. Richey has sold to J. C. Dixon a half interest in the Mustang quartz mine, 3 miles northeast of Arastraville; also a half interest in a water right on Mustang creek.

T. H. Woodside and associates, who are working the Nate Clark gravel mine on Table mountain, near Springfield, have commenced the construction of a ditch from Gold hill to their property so as to wash their gravel at the mine. Their incline shaft is down 120 feet and is in gravel which prospects. Another 100 feet will be sunk hefore commencing to hreast gravel.

O. H. Perry of Boston, Mass., has sold his interest in the Clio mine and mill site at Jacksonville, together with all improvements, to the Clio M. & M. Co. for $20,000. It is expected to start up the mine.

COLORADO.

The Colorado Mine Operators' Association has perfected its organization and elected the following officers: President, A. Winslow of Telluride; vice-president, J. H. Weddle of Leadville; secretary-treasurer, E. A. Colhurn of Colorado Springs and Denver. Thirty-eight votes were represented at the meeting from Aspen, Leadville, Lake City, Telluride, Ophir, Silverton, Central City, Cripple Creek, Georgetown and Idaho Springs. The executive committee has framed the hy-laws and named the standing committees. The members of the Association declare that the Association is demanded by the times. All other great interests are organized and it has become evident that the mining industry of Colorado required the same solidification. One of the members put it in this form saying: "This matter of hiring our labor from a lahor trust and selling out ores to a smelter trust, hy which we are hetween the upper and nether millstone, so to speak, is getting too oppressive and something must be done to relieve this or mining in Colorado will he extinct in another ten years. Matters can he conducted more advantageously, more profitably and far more satisfactorily to all concerned, and this Association will provide the means."

BOULDER COUNTY.

The Silver Lake G. M. & M. Co., at Silver Lake, near Ward, have a tunnel in

260 feet showing a well defined vein, and a shaft down 95 feet. The assays have run from $17 to $102 per ton. The ore is a copper sulphide. The company is planning on building a mill as soon as developments justify it.

CHAFFEE COUNTY.

Manager G. R. Dickey of the Tasmania Copper M. & S. Co. is to increase the working force on the Last Dollar and Dickey Boy mines at Winfield. Supt. R. Taggart has done considerable exploration work and has opened two entirely new veins in the company's territory. A tramway will be built from the mine to the smelter, 3500 feet long. The main vein is 30 fee wide and has 8 feet of quartz carrying 7% copper and good values in gold and silver.

CLEAR CREEK COUNTY.

The Narragansett tunnel at Silver Plume has cut the Alendria lode, which shows well. This is one of the lodes for which the tunnel was started. The tunnel will go through twenty-three claims that have been bought and located by E. Aldrich, tho present owner.

In the Scott tunnel at Silver Plume, which is being driven into McClelland mountain by a New York company, represented by W. S. Ross of Grand Junction, 90 feet were made in March by hand. The plant of machinery to be erected at the tunnel is expected, with electric power drills, to advance the tunnel about 200 feet a month. The contract has been let for 1400 feet.

The body of rich ore on the Wisconsin, at Silver Plume, it is stated, still continues to hold out and shows from 12 to 14 feet of mixed ore that runs from 300 to 500 ounces silver. The standard of shipments has been from $3500 to $4500 worth of ore turned out by fifteen men each week.

The Republic Con. Co., on Douglas mountain, near Idaho Springs, is drifting on the Ruby vein, opened by a 300-foot crosscut, and is shipping mill dirt of good quality taken without sorting from a 9-foot ledge. Manager Burgess is preparing for the introduction of power drills and a broad-gauge tunnel from the base of the mountain is projected.

The Sporting Times mine has resumed operations with an increased force of men. The breast of the drift is now in a large body of hard quartz in which considerable bodies of solid ore are visible.

J. Hite is completing the installing of the new hoisting plant on the Capital Prize group at Georgetown. The boiler house has been built on the dump of the main tunnel and the steam pipes will be laid in the tunnel to the shaft and carried up the shaft to the engine. The shaft house is completed. The shaft is now down from the surface to about 75 feet below the tunnel level and is to be used to explore the Griffith lode beneath the town. A pump for handling the water will be put in.

The Hidden Treasure Gold & Silver Mines & Mills Co. has been incorporated, capital $100,000. E. G. Hovey of Denver is president and J. F. Stanish of Georgetown general manager. The properties of the company are the Hidden Treasure group at Empire and the Edinburgh group near Georgetown, nine lode claims in all. The new company plans the driving of a crosscut tunnel from the base of Lincoln mountain to explore its own properties and those of other parties lying on the mountain, and also contemplates the erection of a concentrating mill for handling the low-grade ores that will be found.

EL PASO COUNTY.

The Portland Cement Co. is building 6 miles east of Florence a 1000-barrel Portland cement factory, making an investment of about $225,000. Florence and Denver people are interested. The concrete is being laid for the piers and the foundations are being built for the stationary engines. The company has bought several hundred acres of land upon which are extensive beds of cement shale. Supt. Moore of the works says the shale differs from that employed in the East, the ingredients being mixed by nature in proper proportion.

FREMONT COUNTY.

The new copper reduction plant at Parkdale, erected by the Greenhorn Mountain M. & M. Co, composed of Denver and Springfield, Ill., people, has been completed. The mill is equipped with a 100 H. P. boiler and a 75 H. P. engine to run a dynamo and air compressor, a hot air receiver, a thirty-ton crusher and pulverizer for grinding fifty tons of rock daily to 130-mesh, or seventy-five tons of rock to 60-mesh.

R. C. Vidler has bought the remaining two-thirds interest in the Argentine tunnel of C. Johnson of Georgetown and S. J. Anderson of Idaho Springs for $25,000. He has made arrangements for starting up the work in a short time. The tunnel will cut through the range at Argentine pass and will be 10,000 feet long, in which a depth will be obtained of from 1800 to 2500 feet. The tunnel is being built 10x10 in the clear.

GILPIN COUNTY.

Eastern people have leased and bonded the Charter Oak mine at Russell and have begun repairs preparatory to sinking the main shaft an additional 200 feet. W. H. Quintrall is Supt.

The Black Hawk people, operating the Fannie mine, on Cyclops hill, near Central City, are getting some high-grade silver in sinking the shaft. The Fannie has a good record as a producer of high-grade silver ore in the early days. A strike of 7 inches of silver ore has been lately made that assayed 1700 ounces silver to the ton.

The Saratoga mine at Central City, under the management of Dr. Carpenter, has been made a dividend payer by the addition of better machinery and methods of mining. The gross output for the month of March exceeded $25,000 or at the rate of $300,000 per year. Dr. Carpenter holds that a properly equipped mine can break ore as cheaply upon company account as can be done by individual lessees, so all work at the Saratoga is done upon company account. There are 105 men upon the company pay roll at present and the monthly pay day disburses about $8500 in wages, in addition to which there is about $2000 per month paid out at Central City and Black Hawk for supplies.

J. M. Shrote, secretary of the Benzie Investment Co. of Denver, has completed arrangements to buy the Elizabeth lode, situated in Lake district, from W. Smith of Central City. The property has a 90-foot shaft. A. B. Drake will be Supt. and it is anticipated that a plant of machinery will be installed.

GUNNISON COUNTY.

J. T. Quigley, representing Galveston, Texas, people, has bought the Whig group of five claims located in the Gold Brick district, between Pitkin and Ohio City, from Scott & Kienbush of Pitkin. The new owners will, it is understood, do extensive development work.

LAKE COUNTY.

F. Bartlett has opened up ore in his Mount Elbert property, near Twin Lakes, and says they have a considerable quantity of shipping and mill ore already blocked out, with which they intend to start their reduction works as soon as new machinery now needed for the enlargement of the plant can he put in.

The American Placer Mines Co. has been incorporated at Twin Lakes by A. G. Clark, E. A. Horner and A. L. Welch, with capital of $10,000, to operate the Young America group of claims, comprising about 10,000 acres near Twin Lakes. A large steam shovel will be installed.

PARK COUNTY.

Manager D. E. Rowe has started work on the Snowstorm and Beaver Park placers, at Alma, for the Snowstorm Hydraulic Co. He states that both properties will he put in operation this year, and offices, men's quarters and boarding houses will be erected at each of the properties, pipe plants and ditches supplied, and the placers systematically worked.

SAN JUAN COUNTY.

On Green mountain, at Silverton, the development of the Green Mountain M. & M. Co.'s properties, under Supt. Bielefeldt, on the great Osceola vein, shows good grade ore, carrying galena, iron and copper pyrite, with some gold and silver values. This ore body is 15 feet wide and testing shows the average value about $20 to the ton.

E. O. Buskirk and W. Haas have bonded the Crookson and Sunset claims near Silverton to the Western States G. M. Co. at $12,000. Several other properties have also been bonded to the same company.

SAN MIGUEL COUNTY.

Over 250,000 feet of lumber has been delivered to the Tom Boy Gold Mines Co., at Pandora, for the erection of the new mill, boarding and hunk house, timber shed and the other buildings that will be constructed at the Tom Boy this summer. The contracts call for over 1,000,000 feet. It is the intention of the company to have the buildings completed before snow falls next winter.

The Gold Metals M. & M. Co. incorporated to operate in Prospect Creek basin, near Telluride, is to commence operations at once. The tunnel will be advanced about 60 feet and the Gold Metal vein intersected. The average value of the ore is $20, principally gold, and is free milling with concentration. The company owns eleven claims, which can be worked through the tunnel, and has leased a 20-stamp mill, which it is repairing and getting into running order. Electric machine drills will be installed. P. M. Finnis, secretary of the company, is in charge.

SUMMIT COUNTY.

The work of repairing and overhauling the West Side concentrator, at Breckenridge, by the Puzzle M. & R. Co., has been completed and the plant is running on ore from the Puzzle Extension mine.

On April 15 the Gold Pan Co.'s pipe line at Breckenridge was filled with water and washing commenced on the Maggie placer.

The drill on the Tyra placer has bored to a depth of 330 feet—still in wash and sand. It was expected that solid formation would be encountered at not over 200 feet in depth.

TELLER COUNTY.

The Golden Cycle G. M. Co., at Cripple Creek, reports its production for March as 3400 tons, the net value of which was $39,000, this being the value of the ore after the freight has been paid the railroads and the treatment charges have been settled. The net profits to the company were $17,000.

W. S. Stratton is working two shifts in the Chicago and Cripple Creek tunnel and advancing it about 10 feet a day. The tunnel is now under Gold hill and in 3800 feet from the entrance, which starts at the Abe Lincoln mine in Poverty gulch. A crosscut has been driven 1400 feet toward the Baby Mine claim of the Temomj company. It will require another 100 feet before ore is encountered.

A strike has been made on the Gold hill property of the Colorado-Cripple Creek G. M. Co. at Cripple Creek in the main working shaft at the depth of 500 feet, where a vein 10 inches in width was encountered. The rock assayed from three ounces gold upward and forty-three ounces silver upward, with 2% of copper. Manager R. G. Mullin will cut a station at the 600-foot point and drift over to the ore, sbould the vein dip out of the shaft.

The El Paso Con. Co., on Beacon hill, at Cripple Creek, in the construction of the new ore house, has set sufficient room aside for the installation of a complete sampling works, and all ore that is shipped will first be sampled, so that when the shipment leaves the mine the company will know what will be received for the ore. Another innovation to be started at the El Paso is the use of double-tracked cages in the new working shaft, instead of the use of double-deck cages. The great advantage of the double-tracked cages over the double-decker is that both cars are rolled on to the cage, and one signal starts it up toward the surface; while with the double-decker, in use, the machinery has to be used to get the next deck to the level. That takes time. The new shaft of the El Paso is to be 5x14 feet, 8 inches in the clear, and will he sufficiently large to permit of the use of a cage that will hold two cars on one deck.

A movement is reported to he on foot to bring together into one company, under one management and one hoard of directors, with a capitalization of $60,000,000, the producing mines of the Cripple Creek district, the Colorado Springs & Cripple Creek District Railroad and the Portland mill, located at Colorado Springs. The companies to which the suggestion was made hy President Burns of the Portland and which, it is reported, have tentatively indorsed the plan as one that would result to the great advantage of all the parties to the consolidation, are: The Portland G. M. Co., Strong G. M. Co. and Ajax G. M. Co.; the new consolidation recently announced by the Woods Investment Co.: The Anchoria-Leland M. & M. Co., Midget G. M. & M. Co., Gold King M. Co., Colorado Springs & Cripple Creek District Railroad Co. and the Portland mill.

IDAHO.

BOISE COUNTY.

The lower tunnel on the Mountain Ram claim at Gamhrinus has struck the ledge, 3½ feet wide and all fine ore, some high grade showing a value of $158 a ton.

IDAHO COUNTY.

At the Goldbug group of mining claims, located near Dixie, owned by J. D. Glover and associates of St. Paul, Minn., the shaft has been sunk 100 feet and 200 feet of drifting done. The ledge is from 25 to to 30 feet wide between walls and shows ore going $15 to the ton. The company has let a contract for sinking the shaft 100 feet deeper and is making arrangements to erect a large mill this summer.

F. S. Hobbs of Lewiston, who has arrived from Thunder mountain via Dixie, says that the Dewey Co. has ordered 100 more stamps and has located another mill site on Monumental creek, 3 miles from the mine. The ore will be transported to the new mill hy a wire tramway. There are several groups of Pittsburg people now interested in the camp and one of them, he states, is planning the putting in this summer of a 250-stamp mill on Big creek, over 30 miles from the Dewey.

WASHINGTON COUNTY.

J. M. Edwards, manager of the Golden Crown G. M. & D. Co., owning a group of claims on the Idaho side of Snake river, opposite Imnaha, has started a force driving 50 feet more of the tunnel on the Golden Gate.

MICHIGAN.

HOUGHTON COUNTY.

At the Baltic and Champion mines, near Houghton, preparations are being made for increasing production. At the present time two heads of stamps are in operation at the Baltic mill and one old-fashioned head at the Atlantic mill. Later on four heads of stamps will be operated at both the Baltic and Champion mills. The Champion with its four modern shafts, it is claimed, can produce more rock daily than the Calumet & Hecla.

ONTONAGON COUNTY.

A discovery of gold has been made near Matchwood in paying quantities. Hancock parties are interested.

MONTANA.

FERGUS COUNTY.

The North Moccasin M. Co. at Kendall has decided to erect a 150-ton mill this summer.

The ore in the King-Barnes mine at Kendall is quarried from the side of a mountain, which, so far as explored, is a vast body of mineralized rock, nearly all of it carrying gold in sufficient quantities to make it profitable. Nearly all of the ore is taken from an open cut, 800 feet from the company's mill and may be approached along a car track that skirts the hill and finally penetrates it through a tunnel directly below the cut. In the tunnel are chutes from which the cars are loaded. When the ore is blasted it falls into the chutes. It is hauled out in two-ton cars drawn by a single horse, and two men are employed in loading and unloading them. It is possible for the two men to send sufficient ore to the 100-ton mill in six hours to keep it employed twenty-four hours. The breaking down of the ore in the cut is carried on hy drilling holes down from 4 to 9 feet and blasting them simultaneously. Often as much as 100 tons are hroken by one round of shots, and the remainder of the day and perhaps the whole of the following day are required to break up the rock so that it may be passed to the cars. In these hlasting operations nothing is considered waste — all the material finds its way to the mill. The King-Barnes mill has been running since last September, and as over 100 tons of ore a day are put through the cyanide tanks, it may he stated that up to date about 22,000 tons have heen treated. It requires 17 cubic feet of the ore to make a ton. At present forty miners and ten muckers are employed in the mine. Foreman McCormick states that two men in the open can furnish about 90% of the ore sent to the mill. In all of these operations from 150 to 200 pounds of powder a day is used. The ore is treated by the cyanide process and the cost of treatment is so small that $3 ore can he mined at a profit. It requires four days from the time the ore enters the crushers till it is run off into the slum pond. E. W. King is Supt.

FLATHEAD COUNTY.

The Libby placers are heing developed hy a Butte company under F. Whiteside as manager. The company is preparing for extensive work and has acquired nearly all of the ground on Libby creek south of Bear creek. It is reported that some of the company are figuring on building a railroad up the creek from Libby.

The Northern Montana M. Co. has been incorporated at Libby to operate on Fourth of July creek in West Fisher district. It is now putting up a mill.

The Beager placer mine in West Fisher district is reported turned over to Eastern men, who will equip it with a hydraulic plant with the intention of doing considerable work this season.

LEWIS AND CLARKE COUNTY.

The machinery for the 60-stamp mill which the Big Indian G. M. Co. is building on the Winscott mine, near Helena, has been received and the work of building the mill is under way. The mine is a large deposit of free-milling gold, claimed to be 480 feet in width, and, so far as developed, over 800 feet in length.

Mr. Alexander, manager of a St. Louis and Kansas City, Mo., syndicate, organized to operate the Josephine mine above Rimini, has started work on the property, which will be developed on an extensive scale preparatory to the erection of a concentrating mill.

MADISON COUNTY.

W. A. Heimbucher, assistant superintendent of the Montana C. & G. M. Co., has started operations on the Ballarat mine, which is one of a group of copper prospects owned hy the Montana Co. on Stone creek, about 12 miles northeast of Dillon. T. W. Heatherly is Supt.

SILVER BOW COUNTY.

At the Edith May mine, near Butte, the shaft is 65 feet deep and the vein 18

inches wide, carrying ore that averages 20% copper and thirty-two ounces silver. The property is being worked by J. Cummings & Co. under lease. It is owned by G. H. Casey, P. J. Brophy and C. W. Newton of Butte.

NEVADA.

LINCOLN COUNTY.

The Osborne property, near Pioche, now owned by H. Helland, of Pioche, is producing ore that yields $14 in gold to the ton, 40 ounces of silver and 45% lead. The vein is 2 feet thick. On the Amador property a bond has been taken by Roberti & Clepodina, who have started work.

NYE COUNTY.

The O'Meara-Lynch Co. has secured a contract from the Tonopah M. Co., at Tonopah, to sink Lease No. 44 shaft 500 feet from the present depth of 175 feet. The shaft is to be 4x6 in the clear, with additional manway. A large hoist engine will be installed, and an electric power plant for air compressors. The new contract, it is stated, will necessitate the employment of 150 men, as the contract calls for the extracting of ore on both sides of the shaft.

On the Halifax group at Tonopah the shaft is down 120 feet and has struck mineralized porphyry. The machinery for the whim is being put in place and the shaft will be continued down to 250 feet.

At the California shaft of the Ohio-Tonopah Co. the timbering is completed and the rig prepared for deep sinking. A. Z. Dodd is foreman under S. H. Knapp.

The Tonopah Fraction Co., which has no surface indications of a ledge on its claim at Tonopah, after sinking through 240 feet of wash lava and through the alluvium beneath, is reported to have struck in the solid formation a rich lead, resembling the Con. California and Virginia ore of the Comstock. Rhyolite lies on each side of the lead. The rock shows crystallized horn silver in large quantities and is bonanza ore.

WASHOE COUNTY.

The Ora mill at Olinghouse is being overhauled preparatory to crushing 200 tons of high-grade ore from the W. C. Williams Cabin claim.

The Denver, Colo., people who have a bond on the Slip mine have in view the extension of the main tunnel 500 feet. The Slip mill has been overhauled and put in shape to make a run on ore from the Jumper mine. The Denver people have this claim bonded.

San Francisco people have been examining properties at Olinghouse and have five claims under bond.

A discovery has been made by J. L. Wedekind near Reno and close to the V. & T. railroad track of a large deposit of a soluble mineral, believed to be alum, carrying 38% sulphuric acid. On the deposit is a spring that flows water highly impregnated with alum.

J. Burke, of Steamboat, is operating in the Great Eastern quicksilver mine, a mile and a half north of Steamboat, and is taking out considerable cinnabar ore, valuable not only for mercury, but for the gold and silver that are also carried.

NEW MEXICO.

GRANT COUNTY.

Grant county miners have appealed to the Santa Fe Railway Co. to give them lower rates on ore to the smelter at Cerrillos, in Santa Fe county. Since the smelter trust has closed the smelter at Silver City, the miners of southern and southwestern New Mexico find it unprofitable to mine their low-grade ores, and in consequence the situation in the mining districts of Grant and adjoining counties is very quiet. Siliceous ores carrying as high as 10% copper cannot be shipped and treated with profit at the trust smelter at El Paso. As a consequence, the tonnage of ore carried on the Santa Fe Railway from Silver City and the Whitewater branch is very small.

LINCOLN COUNTY.

The American G. M. Co. at Nogal has fifty men employed. A shaft is being sunk on the American mine and tunnels are being run on the other properties.

The 700-foot tunnel being run on the Turkey Creek mines by the Iowa & New Mexico M. & M. Co. is now in 300 feet and has cut one body of ore 20 feet thick which assays as high as $18 to the ton in gold. When the tunnel is completed the end will be 1500 feet under the surface. The work on the Schelerville mines belonging to the same company is to be resumed. A new hoist engine, air compressor and machine drills are being placed.

OTERO COUNTY.

J. Stone and J. K. Smith have located a fine body of onyx in Cox canyon, near the railroad.

OREGON.

BAKER COUNTY.

(Special Correspondence).—C. J. Allen, who recently bought the Monumental mine, is having the old works equipped with air pipes and is installing drills for extensive exploration work. It is a silver proposition and has been a good producer.——The Golconda mine has been taken up by J. H. Robbins and associates. The old works are being cleaned out and twenty-five miners employed opening new ground. The property is equipped with a mill.——The Eureka and Excelsior mine is to be reopened hy New York people and a new shaft will be started, going down about 300 feet below the old workings, and a crosscut run to the vein. The property has a complete silver mill.——The new hoist at the Bonanza has been completed and started up. It is the largest in the district and designed for a three-compartment shaft 2500 feet deep. The present workings are 500 feet deep.——The Buckeye mine has some rich ore on the 250-foot level, showing less zinc and better values in gold and copper than that found on the upper levels.——The Columbia mine has been started up after a sixty-day shutdown.

Sumpter, April 21.

The Old Abe G. M. Co. has been incorporated at Sumpter and development work will begin at once on its properties near Minersville. F. P. Schultz of Milwaukee, Wis., is president and R. F. Evans of Sumpter secretary.

The old Monumental mine, near Sumpter, owned by "Monumental" Miller, has been bought by C. J. Allen of Portland. He has commenced operations and proposes to install a sinking plant and will put a shaft down on the ledge for several hundred feet. The mill on the mine was one of the first brought into eastern Oregon.

GRANT COUNTY.

The Kittanning M. Co. of Seattle, operating under bond the Big Four group of claims, near Granite, has let a contract to G. J. Barrett to construct 200 feet more tunnel on the claim.

JACKSON COUNTY.

Mr. Mendenhall, owner of the Roaring Gimlet mine of the Kanes Creek district, near Gold Hill, has made another clean-up at his new property, taking out $3000.

The Bill Nye M. Co. has made a strike on their mine on Galls creek, near Gold Hill. Major Andrus, the Supt., has opened up 2 feet of quartz running from $150 to $200 per ton. The new shaft is now down 50 feet and the whole bottom of it is in ore going better than $100 per ton.

H. S. Sanford, manager of the Shorty-Hope M. Co., has received orders from the directors at New York to proceed with the development of the property at Ashland and has started work with T. W. Hill as foreman. A 750-foot tunnel is to be driven on the ledge, which will give 110 feet of stoping ground and unwater the mine. There is a 10-stamp mill and other equipment on the property.

The Last Chance G. M. Co., of Ashland, has been incorporated, capital $20,000, by O. C. Tiffany, R. P. Neil, H. L. Whited, L. L. Mulit and D. A. Applegate. It is the intention of the company to develop a quartz proposition near Gold Hill.

JOSEPHINE COUNTY.

A 40 H. P. compressor, three boilers and other mining machinery are being installed at the Oregon Bonanza mine In the Williams district, near Grants Pass. Mr. St. John, the manager, has uncovered a considerable body of ore.

A 10-stamp mill and other machinery is being installed on the Eureka mine, near Grants Pass. The Eureka, Cal., people who own it have bonded it to the Victory G. M. Co. of Chicago, Ill. This last-named company has sunk the main shaft to a depth of 400 feet, opening several levels and uncovering a ledge of high-grade ore 8 feet wide.

The placer and quartz gold yield of Josephine county for 1901 by the leading districts is as follows:

Althouse	$ 45,120
Waldo	95,000
Williams	100,070
Galice	112,100
Grants Pass	46,000
Grave Creek and Mount Reuhen	556,000
Total	$954,290

UNION COUNTY.

J. M. Ferguson & Co. of La Grande, who have leased the Camp Carson placer mines, in the upper Grande Ronde river, from Imbans & Foley for a term of years, are putting their excavating and elevating machine in readiness for starting up by May 1. This hydraulic excavator and elevator is expected to handle some 3000 cubic yards of earth per day. The machine will have a 14-inch steel pipe, and 600 inches of water through a 4-inch jet under a pressure of 300 feet is to force the gravel up into an elevator flume 30 feet high.

SOUTH DAKOTA.

There are ten stamp mills working in the Black Hills this year, treating ore by amalgamation. Six of these belong to the Homestake, the Star, Highland and Old Eighty, at Lead; the Deadwood-Terra and Caledonia at Terraville, and the De Smet at Central City—900 stamps all told. At the Uncle Sam mine, belonging to the Clover Leaf M. Co., the mill has thirty stamps; at the Holy Terror, fifteen stamps of the Keystone mill; near the Holy Terror, the new 40-stamp mill of the Elizabeth M. Co.; at the Clara Belle, near Custer, in Custer county, a 2-stamp mill. All free-milling ore carries a percentage of value in sulphides, and most of the stamp mills employ concentration. In the case of the Homestake the concentrates are shipped to a smelter and the tailings are treated by the cyanide process. At Keystone cyanide has been found impracticable, owing to the arsenic in the ores, and experiments are being made with other processes. The Clover Leaf M. Co. will enlarge its mill to sixty stamps. The Tycoon M. Co. has bought the old custom mill of Ingram & McEachron at Keystone and is replacing the worn out machinery. It has twenty stamps. The Grizzly Bear 10-stamp mill near Hull City has been repaired. The Cuttysark mill, near Mystic, has been leased by Eastern men, who have bought the Basil property of T. Tracy. The 40-stamp mill of the Ajax M. Co., at the Standby mine, is to be started. The Hidden Fortune G. M. Co. will build a 200-stamp mill, with cyanide annex, probably at Deadwood. The North Star Co. will put in a 20-stamp mill, the Cochran M. Co. twenty stamps, the Ohio-Deadwood M. Co. twenty stamps and the Castle Creek M. Co. ten stamps. It is likely that the Grantz G. M. Co. will remodel the St. Elmo 10-stamp mill and add ten stamps.

LAWRENCE COUNTY.

A tract of 313 acres of ground near Ragged Top has been bought by G. A. Dunn, of Mercer, Utah, representing an Eastern company, which has been sold by Zinc Bros., A. Hattenbach, W. L. McLaughlin, H. Hulin and associates, of Deadwood, for $45,000. Work is to be started at once exploring and developing the ore bodies.

The Dakota G. M. Co., operating a 100-ton cyanide mill in lower Deadwood, has cleaned up from an eight days' run 600 ounces of bullion, valued at $9000. The ore is said to have yielded an average of $11 per ton.

The Gustin-Minerva stamp mill in Blacktail gulch is being enlarged by the addition of twenty stamps, making it forty stamps. The mill and mine are owned by the Boston-South Dakota Co., with T. Corkhill as Supt. A cyanide plant in connection with the stamps is contemplated hy the company, to be built some time during the year.

UTAH.

BEAVER COUNTY.

F. Morehouse, manager of the Beaver G. & C. Co., near Milford, states that the company will start sinking a shaft on the Lady Curzon group.

The Bluebird group of claims, near Milford, has been bonded at $2000 by A. L. Fotheringham and E. A. Hodges. There is a 15-foot vein in the mine, showing 3% copper, besides values in gold and silver. The property will be actively developed.

A tellurium discovery has been made in the Hayseed group in the Granite range, near Milford, hy W. D. Williams, S. E. Potts and J. R. Lindsay. The property will be worked this season.

A. B. Lewis of Salt Lake City has made final payment on the O. K. property at Milford for the Majestic C. M. Co., and is arranging for an extensive increase in its development, including the construction of a smelter.

JUAB COUNTY.

The traffic managers of the Tintic railways are considering the reduction of the rate on low grade ores, and it is semi-officially announced that they are ready to reduce the present tariff from $2 50 to $1.50 on ores of a certain grade, providing the smelters will make a sufficient reduction in treatment charges. There is hardly a mine in Tintic but can quadruple its tonnage under such concessions.

KANE COUNTY.

The Copper Cliff M. & M. Co. has been incorporated at Springville, capital $20,000, with W. A. Warthen president and H. L. Cummings secretary and treasurer. The company owns the Cliff, Kruger, Iron Duke and Jim Lew claims in the Pahreah mining district.

SALT LAKE COUNTY.

The Rio Verde M. Co. has been incorporated in Salt Lake City, capital stock $100,000, with W. C. Hall president, J. H. Woodman secretary. The company do placer mining, etc.

It is reported that the Utah Con. Co. earned $700,000 net as a result of 1901 operations, notwithstanding sales of copper at low prices. The company entered the year 1902 with between 2,000,000,000 and 3,000,000,000 pounds of copper on hand. The company has paid two dividends of $1.22 per share during the year, calling for the disbursement of $732,000.

H. E. Thomas, Supt. for M. C. Fox at the Storey mine at Bingham, says the mine is now showing a large tonnage of ore, much of it of shipping value. The mine is employing ten men, and 1000 tons of copper-iron ore is to be marketed as soon as it can be handled; also a smaller quantity of galena.

The Jordan M. & M. Co., capital $5000, has been incorporated at Sandy to operate under lease the Chicago mine at Bingham. R. M. Holt is president and W. D. Kuhre secretary and treasurer.

SUMMIT COUNTY.

The Ontario M. Co.'s report for 1901 states that development work to the extent of over 2300 feet has been accomplished, almost all of it on the 1700-foot level and in the workings immediately heneath. The total receipts for the year were $514,257.51, with expenses reaching $356,952 88, leaving a net profit of $157,-304 63, and a reserve fund in the treasury of $402,828 61. Dividends to the number of 223 had been paid up to December 31, 1901, and the mine, during its entire operation, has produced 34,455 tons of tailings, 629,121 tons of ore, which have contained 37,234,663.34 ounces of silver, which have been sold for $33,155,950.51, and from this dividends have been paid, with dividend No. 224 recently declared, to the amount of $13,797,500.

The Great Western mine at Park City, D. Evans manager, holding 2500 acres of patented ground, has had three crews of men doing preliminary work through the winter, and a large force will now he employed.

The Lake Flat M. Co. of Park City has been incorporated, capital $37,500, with H. Shields president and J. P. Burns secretary. The company owns the Lake Flat claim at Park City.

TOOELE COUNTY.

At the Stockton G. M. & M. Co.'s property at Stockton, J. J. Trenam manager, the double-compartment shaft has been sunk from the 300 to the 400-foot level in thirty-three days. A station has just been completed on the 400 level 9x19 feet in extent and 7 feet high, and the sinking of the shaft another 100 feet started. With water level reached the installation of a concentrator will follow for handling the low-grade ores already blocked out.

WASATCH COUNTY.

N. Robinson has returned from Midway, where with others he is interested in a group of ococerite producing claims. Considerable development work has been accomplished. Mineral wax will be shipped at an early date.

WASHINGTON.

CHELAN COUNTY.

Davenport people have incorporated the Holden Extension G. & C. M. Co., capital $1,500,000, to operate two claims on the Holden lead. The trustees are S. Griswold and J. C. Bowen of Davenport and W. J. Bowen, A. H. Murdock and W. P. Robinson of Chelan. W. J. Bowen is secretary and general manager. The Holden ledge is about 200 feet wide. The ore runs from $5 to $30 a ton in copper, gold and silver and has, it is claimed, an average value of from $12 to $18 a ton.

FERRY COUNTY.

On the Silver Dollar mine at Republic, W. M. Crummer, manager, a two-compartment shaft has been started about 100 feet east of the old shaft. It is to be continued to a depth of 200 feet before drifting from it. A windlass is to be used until steam hoisting machinery can be brought by the railroads.

FOREIGN.

BRITISH COLUMBIA.

Arrangements are being made to erect a 50-ton capacity mill on the property of the Canadian King Con. G. M. Co.'s mine near Erie. J. M. Allen of Colorado Springs, Colo., is manager.

At the Arlington mine at Erie sixteen horses are constantly employed hauling the ore to the railway. In addition to this the company is operating its mill and paying a quarterly dividend of $10,000, the initial one having been distributed last month.

The Bayonne mine, reached from Ymir, is heing developed hy Davenport & Gilliam of Spokane, Wash., and the vein, which is of free milling ore, is clalmed to be fully 30 feet wide. It is very difficult of access, heing in the heart of a new section near Kootenay lake.

In the Black Hawk claim at Ymir, owned by N. Iverson, a crosscut tunnel is heing run ahout 80 feet to tap the vein. On the surface the vein shows about a foot of galena ore.

The Le Roi company has shipped four

MINING AND SCIENTIFIC PRESS.

Whole No. 2180.—VOLUME LXXXIV. Number 18. SAN FRANCISCO, CAL., SATURDAY, MAY 3, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

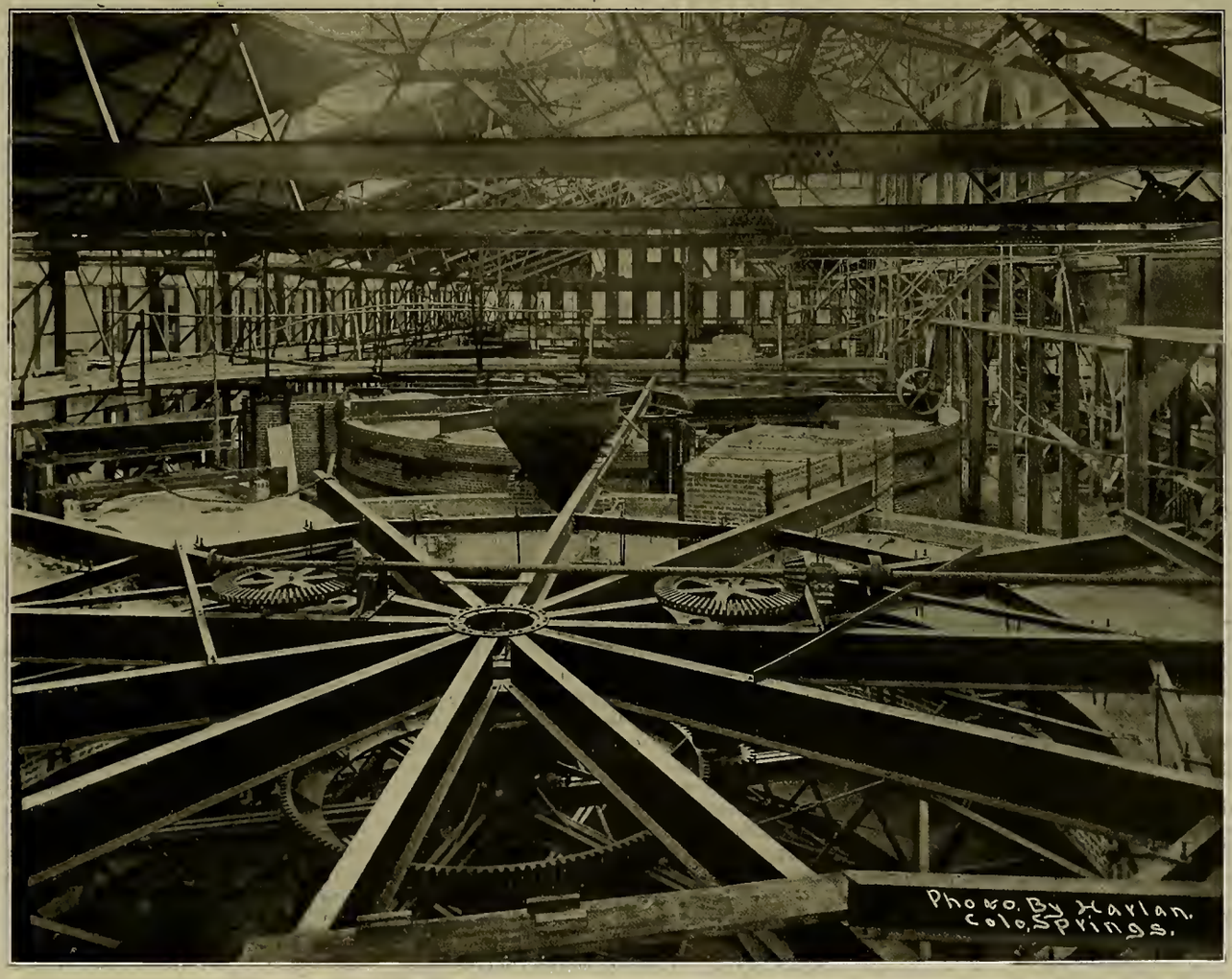
Placer Gold Under Tundra at Nome, Alaska.

It is reported that borings made with a prospecting drill in the tundra near Nome, Alaska, have proven the presence of rich placer gravels in extensive minable deposits. The reports do not give much detail, but the finding of gold in the tundra confirms the opinion advanced by this journal when the reports of the working of rich beach deposits at Nome were first announced. It seems strange that with the general knowledge of the mechanical laws of the distribution of placer gold that is available, that it should have required the time from the summer of 1899 to the winter of 1901–02 to prove the existence of payable gold deposits in the half dozen miles of tundra lying directly between beach gold deposits at Nome where the miners had no bedrock, and the Anvil creek deposits where the miners were working on bedrock. Both of these points were exceedingly productive and their physical relation so suggestive, that the inference that there was equally rich gold-bearing ground between could not be avoided by any miner who gave the matter even a moment's hard thinking as he plodded laboriously from Nome over the tundra to the Anvil creek diggings. The explanation probably is that the moment's hard thinking was not given to the matter. If it had been, the large amount of machinery that was dumped by the thousands of tons on the Nome beach in the summer of 1900 to be abandoned there, would have been put to service in the tundra. Much of it was adapted to the kind of mining necessary in the tundra and entirely unsuited for any other kind of mining, and practically all of the machinery was adaptable to the work that it could have been put to. Another interesting and valuable discovery reported, that it seems surprising should have taken three years to discover, is the peat surface to the tundra. Nome has imported fuel at exceedingly high cost when it was all but built on a fuel bed.

It is to be anticipated, now that the Nome tundra is proven to cover placer gold deposits, that the tundra between other beach deposits and gold-bearing creeks in Alaska will be investigated. It will be well to note that not all the tundra at Nome is proven to overlie gold placers, nor is it even a possibility. The most that can be hoped for is that the tundra-covered deposits will be the down-stream extension of the Anvil creek placers, and will have about the same width of pay gravel and proximately to the linear foot of channel as much gold. The same relation will be found to exist at other points on the Alaska coast. The tundra-covered deposits will be found the down-stream continuation of the creek placers, and will be about as rich. It should be possible to locate these tundra-covered deposits at comparatively little cost, and the working of them should not prove expensive, particularly if similar peat deposits are found associated with them. They promise a not inconsiderable addition to the Alaska gold production and offer an opportunity for the installation of machinery on a considerable scale. The proposed extension of the placer mining under the sea by drifting sounds big, but is of doubtful practicability.

Interior of Portland Mill, Near Colorado Springs, Colo.

The illustration on this page of the roaster plant and on page 243 of the crusher plant are views taken during construction of parts of the interior equipment of the Portland mill, near Colorado Springs, Colo., which was illustrated in the last number of this journal. The striking characteristic feature is the metal, steel-frame construction of everything shown, and the complete absence of wood. Another feature is the number and area of window openings in the roaster room.



The Roaster—Portland Mill, Near Colorado Springs, Colo.

The use of steel to the exclusion of wood for framing, and the increase in the use of glass, are typical of mill construction now as compared with ten years ago. How extreme the change is can be appreciated by comparing the illustrations with the plans and specifications that were standard ten years ago.

THE recent development of a rich ore body at Tonopah in drifting from a shaft sunk through a heavy detrital formation, the earlier discoveries of high-grade ores at Ray, 10 miles north of Tonopah, and the latest one 30 miles west of Tonopah, are conclusive evidence that Nevada is still in the early days of its mining. There are plenty of opportunities yet for prospectors and the capital that buys and works mines, and there are still possibilities of new Comstocks being developed. It is a curious and suggestive fact that the rich Tonopah ores and the bonanza Comstock ores are very much alike.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

San Francisco, May 3, 1902.

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Low Grade Mines.

Successfully exploited low-grade mines are kept prominently before possible investors in new mining enterprises as examples of great mining profits from small margins over low working costs. There is something fascinating in the idea of putting a dollar into one end of a mine and having the machinery of it deliver to you a dollar and a quarter or a dollar and a half at the other end. It looks to the outsider as being simply finding money, and that anyhody could do it with a low-grade mine. The mischief in it, the indeterminate element, is, what is a low-grade mine, and how do you know it when you see it? The experience of many years of mining has taught miners that it is not easy to know the real low-grade mine off-hand, and that many failures of apparently sure winning enterprises have resulted from mistakes of estimation. The outside investor rarely knows this, and is frequently misled to his pecuniary loss, by depending on the false idea that a low-grade metal deposit must be a profitable low-grade mine, because some other well known low-grade deposit of similar metallic content is a profit-earning mine.

The metallic content of an ore body is only one of the elements that combined make a mine. With gold the metal, the elements are simpler and more certainly estimatahle in advance, than where silver, copper or lead, or a combination of them, make up the value. The facilities for low cost of mining and low costs of reduction, and the ore conditions which admit of the last, do not exist in combination with every low-grade deposit. It rarely happens that exactly the same cost outlays can he accomplished for identical work in two different low-grade mines. Even the seemingly simple matter of stamping ore cannot be assumed to be accomplished at precisely the same cost in two adjacent mines.

Every so-called low-grade mine requires an independent analysis of the working conditions and costs. Nothing should he assumed as proven by comparison with the data of some other mine. The chances of actual large-scale testing must be taken before large-scale exploitation is projected. This looks like waste, but it is not. Finally, exploitation should not he hased on narrow margins of possihle profit, even with a hydraulic placer or free-milling quarry of gold-hearing ore. There are always contingencies that increase estimates. Ultimately they may he eliminated, as they have been in many low-grade mines operating now, hut they should be allowed for in the beginning of a mine exploitation.

Where the ore deposit is a low-grade copper or lead proposition, the profit margin must be much larger than with low-grade gold mining. The variation in the market price of the output is an element that can wipe out profit margins faster than economies of mine operation can add to them. It is not safe to estimate on the permanence of any market price. It should always be estimated on as if it was certain to go down. Very small losses in market price of copper or lead will wipe out the profit margin on low-grade ores of these metals. With gold ores estimates can be made with the ton of ore as the unit basis. With copper and lead the unit hasis should be, to avoid misleading deductions, the pound of metal output. A margin of profit on the ton of mine ore output that would seem attractive will demonstrate itself to be unsafe when the margin is estimated in the difference hetween the pound cost of production and the pound selling price. Silver is to a large extent a by-product of mining the other metals. Associated with gold, its amount in low-grade propositions is so small that fluctuations of the market price are not likely to affect the profit margin. With low-grade copper and lead mines, it is often the leading value and materially affects the value of such propositions.

Consolidation of Cripple Creek, Colo., Mining Companies.

Following close on the organization of the Colorado Mine Owners' Association, the announcement is made of a projected consolidation of a number of the larger mining companies of Cripple Creek district, the declared object being to accomplish for the owners of the mines combining what the Colorado Mine Owners' Association is projected to accomplish for the mine owners of the entire State. Since the first announcement the usual number of qualified denials by parties interested have been made, nevertheless the fact that such a combination of interests is projected, and under tentative acceptance, subject to the arrangement of details, may be accepted.

Cripple Creek mine owners have found these common conditions affecting the income from their properties. The depth of the workings has been increasing, adding considerably to the expense of hoisting ore, and adding still more to the cost of pumping water, with the special condition that any mine opened much deeper than its neighbors would have to do some or all of their pumping at its own cost. The custom smelters having been combined, and the custom mills having been combined, the market costs of reducing the ores have heen increased, because the two monopolies working together had the power to increase the costs and their profits without losing the business through competition. The railroads having a monopoly of transportation from mine to mill increased the market cost of transportation, until a local railroad was built by some of the mine owners as an independent company. This brought ore transportation charges down, but the old railroad interest combining with the smelters and mill combinations is now seeking to destroy the competition by making transportation unprofitable to the independent railroad. The labor cost of the ore mined has been increased some by the increase in the wages rate, hut this increase is no more than naturally follows the increase in the cost of living. It is frequently stated that the gold content of the ore is decreasing with the increasing depth from which it is mined, but this cannot be considered as established. The fact is that the lowering of average grade is made by the increase in the quantity of low-grade ore mined. A close analysis of ore output will disclose that for equivalent areas of vein opening the tonnage of high-grade ore is as large now as when the mines were first opened.

The net resultant of these common conditions is that the average profit margin for the mine owner is a rapidly decreasing quantity. Too many are sharing in the division of the output, and those taking none of the risks of the business are getting more and more of the income from it. At the same time there is not the slightest competition in production to affect the sale price of it. The mine owners are literally coining money from the mines, but are getting less and less of what they coin.

The consolidation of mines project seems to this journal admirably contrived to make the best of these increasingly adverse conditions. Consolidated, a common scheme of tunnel opening can be planned and built, so that gravity drainage and transportation can he provided at the minimum of an equitably distrihuted flat cost to the several mines consolidated. The consolidation including the new Portland mill, its capacity doubled as planned, or trebled if needed, the ore reduction charges will be brought down to flat cost. Including the independent line of railroad, the ore transportation charge will be made cost or less than cost. The ton labor cost of ore production will be decreased hy doing less dead work. An additional economy will be effected by huying less plant in proportion to ore production, hy buying plant and all supplies cheaper, hy the less costly and superior accounting system that can he used, by owning and operating common sampling and concentrating works and assay plants.

The net result will be to increase the profit margin on ore mined to the maximum possible, and to increase the quantity that can he profitably mined, for the minimum grade that will pay then will be less than the minimum that will pay now by the sum of the profits now earned by sampling works, railroads, custom smelting works and custom mills. The common conditions that affect the income to the owners from these Cripple Creek mines will be made such that the income will he the largest possihle instead of heing as now the opposite of this.

It is not assumed in the preceding that the consolidation is going to the extent of suhstituting one ownership in the mines for the many that exist now. It is considered that each separate mine ownership will continue to win ore from its own ground and to have the profit of it, but the consolidation equally with all, in the conditions common to all, will make the ton cost charges the minimum flat costs, and the ton profits the maximum without division or deduction. There being no competition in selling production, every mine in the combination can produce ore without other restriction than the business one imposed by the total of the flat costs.

The mine owners of Cripple Creek are fortunate in being able to make so effective and independent a combination. Its success is assured, and it will he an example of trust fighting that cannot fail to he instructive. The essence of it is that the mine owners will be doing for themselves what the existing outside combinations are organized to do and will be doing it better and cheaper.

CONGRESSMAN WOODS' bill for the creating of a Department of Mines and Mining, with a Secretary of Mines, has gone the way of its predecessors since Congressman Cole, representing the same California district, introduced the first of them in 1865. The way that it has gone is to the graveyard of hills that go to Congress without going through it. The excuse given for the failure to move forward even a peg the measure which has had appearances in thirty-seven sessions of Congress, is that the hill to create the Secretary of Commerce blocked it. The latter is a young thing, just out for its first appearance with this Congress, and the hustling Congressmen who particularly want the commerce department have pushed it to the front and have, it is stated, the votes of the mining State Congressmen this session for the promise of their votes for the mining department next session. This will give the two or three conventions that meet this summer an opportunity to resolve again that there must he estahlished a Department of Mines and Mining.

THE Canadian Council has finally aholished the royalty on the placer gold production of Yukon Territory, including the Klondike, substituting for it an export duty of 2½%. The aggregate reduction is not as large as the difference hetween the 5% royalty and the 2½% export tax would suggest. The portion of the gold exempt from the royalty is suhject to the export duty, so that the Canadian Government will now receive very little, if anything at all, less than heretofore while the royalty was collected. The 2½% will, however, be collected at a less expense and will be less felt as a burden by the mine operators than the royalty. It is intimated that a government assay office might be established at Dawson. If this be done, the entire question of taxation of the Klondike gold production can be considered as finally settled and removed from controversy between the mine operators and the Government.

Concentrates.

It is stated that coal can be mined in the Crow's Nest coal fields in British Columbia at $1.25 a ton, and made into coke, the latter will cost less than $3 a ton.

FERRO-TUNGSTEN consists of about 60% iron with 40% tungsten. The principal minerals furnishing the tungsten are scheelite, wolframite and huebnerite.

A MINOR can legally locate a mining claim, but to transfer a valid title it is necessary for the court having jurisdiction where the claim is located to appoint a guardian to act for the minor.

QUARTZ has been volatilized in a furnace consuming retort carbon with a heated blast. The highest temperature commercially reached in other than electrical furnaces is at or about 2000° C. or 3600° F.

THE gold output of Siberian mines is not increasing. The new mines opened barely make up the production lost by the exhaustion of other mines. The gold placers near the Pacific coast are not being worked at all.

THE season for washing is so short in Nome district, Alaska, that stream tin diggings will have to be extra rich in mineral to make their working profitable in competition with the stream tin deposits of the Malay peninsula in Asia.

THERE is practically no difference in the fuel value of different kinds of wood comparing the heat units of equal weights. In measuring the heat value of wood by the cord the denser woods produce the greater number of heat units.

THE price of nickel from 1895 to 1898 ranged from 33 to 36 cents a pound. In 1901 the price was from 50 to 60 cents a pound. The production has largely increased in response to the higher price and an increased demand for consumption.

A GAS POWER PLANT using wood for fuel shows the same ratio of saving as with coal, from 2 to 2.25 pounds of wood being equal to 1 pound of coal in making gas. The wood is used in 2 or 3-foot lengths and of ordinary cordwood diameters.

TWO tangential water wheels to develop 3700 H. P. each under 1600 feet head of water are being made for installation in an electric power station in California. These are the largest wheels of this kind yet undertaken measured in power output.

THE pit of a gold ore quarry can be cleaned of the waste rock caved in from the walls by hydraulicking. Washing through sluice boxes set in the cut or tunnel, some gold is recovered from the ore that is unavoidably washed away with the waste.

WITH plants of 250 H. P. or more, under ordinary working conditions, 1 brake H. P. per hour is produced with from 1.25 to 1.5 pounds of bituminous or anthracite coal, or with 3 pounds of wood. The consumption of water need not exceed 2 pounds per brake H. P. hour.

THE common practice now is to use only one amalgamating plate inside of a stamp mortar and to set it in front of the stamps, beneath the screen frame. The back plate has been largely abandoned through the general use of the narrower mortars, which give increased crushing capacity.

BORAX is mined in California principally from bedded deposits resembling veins. The mineral produced is colemanite. This is treated with sodium carbonate to produce borax. Borax was some years since obtained directly by evaporation from marsh deposits in Death valley, Cal. These are not worked at present.

ON typical free-milling gold ores of grade from $4 to $7 the saving on the plates and in concentrates will be from 80% to 94%. The percentage of saving is checked by assay of the final tailings. The mine run assay is not based on as uniform sampling as the tailings assay and can not as safely be used to estimate percentages from.

A STAMP MILL built on a mill site claim to treat the ore from a group of quartz claims is an improvement that counts as assessment work on the claims. It is not required that it should be built on a quartz claim location in order to be assessment work for that claim, so long as it was built for the working of ores from the claim.

THERE is a difference of opinion as to the comparative merit of a down cast and up cast air draft in a mine shaft. In works not far distant from the surface the up cast current, the blower delivering air at the working face, is satisfactory. For deep and extended workings it is found more satisfactory to draw the fouled air out of the mine by an exhaust.

IN measuring survey lines with a steel tape, where accuracy is important, inexperienced assistants should use a spring balance to keep the tape under a uniform tension. Experienced assistants having once learned the feel of the proper tension can do without the spring balance. A difference of tension of ten pounds will make a difference of 1 inch in 100 feet.

WHERE the percentage of concentrates saved is high, a tailing loss shown directly by assay must be corrected so as to refer to the original ore when loss percentages are estimated. Thus if 30% of concentrates are saved and an assay of the final tails is $1 per ton, the loss per ton of the original ore is only 70% of this, or 70 cents a ton. The percentage of efficiency of the work based on 70 cents a ton lose is obviously higher than where the loss is estimated as $1 a ton.

THE actual power consumed in a milling and concentrating plant should not be far out from the preliminary theoretical estimation of it. In a smelting plant, however, the theoretical estimation from averages cannot be depended on so closely. There are wide variations of load which make it desirable to have an ample margin of power available over theoretical average requirements.

THE steam from a good boiler plant represents about 70% of the heat developed by the combustion of the coal, and a good steam engine delivers about 14% of the heat of the steam as power. The total net efficiency is thus about 10%. The gas from a power gas plant contains over 80% of the heat in the coal, and a gas engine delivers 25% of this as power, making the total efficiency 20%.

THE linear expansion or contraction of a 100-foot steel tape for 1° F. of temperature is .007 inch. Where the difference of temperature between a mine under ground, and the surface is small, less than 20° F., the measurements are sufficiently accurate for connecting surveys without temperature correction. Where the difference of temperature is considerable the correction should be made.

PORTLAND CEMENT is an artificially prepared substance which has the property of hardening in the air or water when mixed with the suitable proportion of water and of remaining hard when immersed in water. In its manufacture a mechanical mixture of finely pulverized limestone or marl and clay or ground shale is calcined, or burned, and the resulting clinker is ground to a fine powder.

THE United States Geological Survey undertakes to do in economic geology work for the mining industry as a whole, and not what the individual engineer or mine owner can do himself. It does not undertake, in surveys and geological examinations, what can just as well be done by the individual engineer or owner, and is so conducted as not to interfere, favorably or unfavorably, with the private mining business of individuals or corporations.

BUILDINGS are being made successfully of concrete from foundation to roof. The concrete is poured into forms, the materials being mixed with more liquid than in massive foundation work. Walls are given the same thickness as if brick was the structural material. Where special strength is required in walls, a steel framing is imbedded in the concrete. Floors and roofs have to be poured in a close webbing of binding rods of twisted steel or iron.

"CONCENTRATES" does not know of any two low-grade mines in California that produced in 1901 more gold than was produced in the entire State of Colorado. There are no such mines, however, neither high grade nor low grade. The declaration that owners could and do conceal the knowledge of such a yield from any one but themselves is an absurdity. It would be physically impossible to conceal the physical evidences of the yield or of the operations which only could produce it.

THAT the quartz boulders in a placer do not show gold does not necessarily prove that the gold came from some other rock or was "grown" chemically in the placer. As a general rule the quartz in a lode that contains gold or any other mineral is less resistant to grinding and disintegrating in the process of erosion than the quartz which is barren. The latter will remain in the placers as cobbles and boulders after the gold-bearing quartz is ground to sand and the gold liberated from its matrix.

A NEW form of coffer dam used in making excavations for construction in water is made of interlocking steel I beams, channels and bolts. Two channels are bolted together face to face, the bolts being just near enough the flange to let the flange of an I beam interlock with the flanges of the two channels. The steel sheeting making the coffer dam is extended by driving first an I beam, then two channels, and then an I beam, until the site is enclosed. A pile driver is used and the dam is made water-tight by tamping with clay the space between the two channels and the I beam flanges. After the work is completed the members are pulled out.

THE rusting of iron consists in oxidation of the metal to the condition of hydrated oxide. It does not take place at ordinary temperatures, in dry air, or in moist air free from carbonic acid. The combined action of moisture and carbonic acid is necessary. Ferrous carbonate is first formed; this is at once oxidized to ferric oxide, and the liberated carbon dioxide acts on a fresh portion of metal. Once started, the corrosion proceeds rapidly, perhaps on account of galvanic action between the oxide and the metal. Water holding carbonic action in solution, even if free from oxygen, acts as an acid, and rapidly attacks iron. In lime water or soda solution the metal remains bright.

MICA is high priced not because it is a rare mineral, like gold, silver, uranium, etc., but because of the hazards and uncertainties of mining it, and the extraordinary proportion of waste between the rough block and the finished product. Even after all this waste, the somewhat irregular sheet of good material must be further diminished in size by cutting or trimming. Electric mica is now generally "thumb-trimmed," but nearly all mica mined in the United States for glazing purposes is still cut into rectangular shape before leaving the mine; and thus nearly one-half of the good portion goes to the scrap heap. Finally, if the square plates of cut mica are again cut up into other shapes, another large fraction of the material is wasted at the point of use.

PORTLAND CEMENT is manufactured in rotary kilns by what are known respectively as the "wet" and the "dry" processes. In the wet process the finely ground limestone and clay are mixed with about 60% of water, and this "slurry" is turned into the higher end of the cylinder in a small stream. In the dry process the "slurry" is only sufficiently moistened to prevent it from being blown away as dust. As the "slurry" travels down the cylinder, it is raised to a white heat, and the resulting clinker runs from the rotary in a continuous stream of white-hot pellets, which, after cooling, are ground to a fine powder in grinding machines, producing such fineness that from 90% to 98% of the cement should pass through a sieve having 100 meshes to the inch.

IN addition to the limestone, shale and gypsum used in the making of Portland cement, the fuel generally used in upright kilns is crushed coke, and in the rotating kilns a jet of gas, of petroleum or of finely pulverized coal is forced in by means of an air blast. The rotating type of kiln now almost universally used in America consists of a steel cylinder 60 feet long and 6 or 7 feet in diameter, lined with refractory material. These cylinders are rotated rapidly in a nearly horizontal position. The fuel used, if bituminous coal, is first dried and ground to a fine dust. This dust is driven into the lower end of the kiln by means of an air blast, and, on ignition, produces a jet of flame some 15 feet long. Crude petroleum and pulverized peat have been used, but coal dust is regarded as the best fuel.

DECISIONS of the Supreme Court of the United States have established the doctrine that where an application for patent has been made and is pending for a townsite the land is at the same time open to exploration, location and purchase under the mineral act the same as any other portion of the public land even though it is the actual occupancy of persons for townsite purposes. But if a patent to the townsite has been issued, or final entry has been made, only such lands are excluded from the operation of such patent as were known to contain minerals of sufficient value to warrant exploitation and working at that time, and lands then located and possessed as mineral lands. Where a mining claim is actually located prior to the entry of the townsite for patent, the rights of the mineral claimant are protected.

THERE are two types of electric furnace, the arc and the resistant furnace. Both are used in industry. The simplest effective form of arc furnace consists of two blocks of chalk carefully dried and carved out so as to form a cavity in which a carbon crucible can be placed. Massive carbon electrodes pass into this cavity, and the arc formed between them plays over the hearth, heating the material to be treated in the manner of a common reverberatory furnace. A typical resistance furnace consists of a slender carbon rod, supported between the ends of two stout carbon rods. The small rod bridges a cavity in the furnace, which can be filled with the material to be treated. On passing a sufficient current the rod is raised to a high temperature, and the charge is heated from its center. This makes its action comparable to the blast smelting furnace.

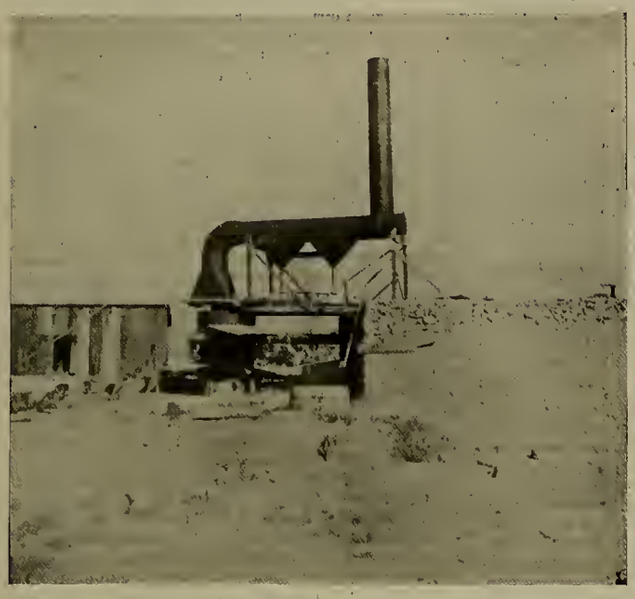
IN the case of Redding vs. Bradford et al., in which Redding was endeavoring to patent the Alabama Con. quartz mine and mill site embracing land in Tuolumne county, Cal., patented in 1875 as the Omega Table Mountain Gravel Mine, Commissioner Binger Hermann says: "It would appear that while the ground in controversy was located as a lode claim prior to the date of placer application—a location certificate having at least been filed and conveyances made thereunder—it has not been shown that a discovery of valuable mineral rock in place was made prior to that date on the land located or that the lode has since been found to exist thereon. The rule is that in a case like this in order to defeat a placer patent it must be shown positively that the known value of the mineral found in lode formation prior to the date of placer application was such as to render the land more valuable as a lode claim and to justify working and developing by the then usual methods of mining."

A MINING COMPANY, incorporated and operated in California in the early '60s, which ceased active operation before 1870, has very likely lost the mines it operated. Until 1866 there was no law under which mining claims could be patented, and while many claims went through the preliminary proceedings for a patent under that law, very few claims were carried to patent. Under the law of May 10, 1872, some of the companies which held claims they were not actively operating patented them to avoid having to do annual assessment work, as provided by that statute. Under the 1866 statute there were no requirements as to assessment work and local customs and laws controlled. These did not always require assessment work to maintain possession, and the title to a mining claim would not become forfeit by failure to work it. Companies which ceased operating in the '60s and which did not patent their claims after the law of 1872 went into effect, have very generally long since lost their claims by failure to do assessment work. In many cases they were relocated several times, and are now largely patented under the later relocations. Later operations have obliterated even the local memories, as well as the physical evidences, of the original ownership. Stock in these old companies is very likely to have only a souvenir value.

Small Smelting Works.

Written for the MINING AND SCIENTIFIC PRESS by HERBERT LANG.

Since the publication of my article, "Smelting Arsenical Ores," in your issue of March 29th, I have received several inquiries relating to the details of the furnace in which the work was done, and particularly as to the cost of plants of this kind. The accompanying illustration is of the Ivanpah copper smelter in southern California, which I built in 1898.



Small Copper Matte Smelter at Ivanpah Mine, San Bernardino County, Cal.

This is a similar plant in many respects to the Slate creek plant, but treats very different ores and produces black copper bars instead of a low-grade matte. Its production in three years has been in the neighborhood of $300,000 worth of bars from 15,000 tons of "carbonate" ores. Both plants are very simple affairs, but the character of the work carried on will sustain a comparison with that done at far more pretentious establishments. The illustration shows the Ivanpah plant during its erection, before the roof was placed over its furnace. The climate of the arid region of California and Arizona renders buildings to a certain degree superfluous. They would not be built at all if it were not for the annoying dust-laden winds which sweep over the country and make existence at times a troublesome thing. A great many, perhaps the majority of the smaller quartz mills, stand out in the open air totally without covering. In the matter of buildings the desert regions of California have somewhat of an advantage over the Sierra regions.

A gasoline engine does the blowing at the Slate Creek works, in common with a practice which has developed slowly in Arizona. It gives fair results, though not, in my opinion, equal to steam for such a continuous performance as blowers are expected to give.

The power required for carrying on the different operations around such small plants is considerable. While experience has shown that 1 H. P. applied to the work of blowing will suffice under ordinary circumstances of pressure, comminution of charge, etc., to smelt five tons of charge, I find it advisable to provide no less than 20 H. P. for the blast of each of these small furnaces, which are 36 and 40 inches in diameter respectively. The demands for power vary so widely that in order to be on the safe side and avoid the not uncommon error of depending too closely upon the theoretical requirements, it is well to install power sufficient for any reasonable emergency. Should the charge be of an infusible sort, or should the fuel be difficult to burn—a peculiarity of the Connellsville coke, for example—a greatly increased blast pressure would be required. In such cases the utility of the high blast with ample blowing power becomes evident. In addition to the blower there is, of course, other necessary machinery, such as elevators, jaw crushers, electric lighting plant, etc., for which provision must be made. It is the common practice to attach each of these to the blower engine, but this is not, in small plants, a wholly advantageous practice, inasmuch as it requires that the one engine shall run at an invariable speed—whereas it is most convenient to vary the speed to conform to the character of the charge which is being put through. I find that a very fair engine and boiler, with piping, etc., constituting a complete though necessarily simple power plant suitable in most important respects for driving a plant of this kind may be had for $1000 or thereabouts. This generally consists of a portable or semi-portable boiler and engine mounted on one base and piped permanently together. It is similar to, though rather larger, than the harvester engines used so much in agricultural regions. While the economy of its actual running is not high, this disadvantage is generally more than offset by the cheapness of first cost, the simplicity of the tout ensemble which makes it easy to understand and correct if anything goes wrong, and consequently by the comparative cheapness of the service given. Engineers in quantity can be had for these simple engines where no one can be had who understands the Corliss or more intricate engines. But the great point of superiority of the portable machines is the fact that they are arranged upon one base, engine and boiler together, which saves a great deal of time and some money in setting up, at a time, perhaps, when neither money nor time are any too abundant.

A country smelter may never require the crushing of any large amount of ore or flux, and therefore may not need a large rock breaker; but a small breaker for sampling purposes is indispensable and should be installed first of all, in order that accurate and satisfactory samples may be obtained for the analyses, upon which the entire work is based. Will it be believed that these preliminary analyses, so indispensable to real knowledge of the situation and consequent to accurate judgment, are frequently neglected, and oftentimes performed in a perfunctory manner, perhaps long after the time when they would have been most useful? A small breaker, sufficient for taking the samples, will not cost more than $250.

The furnace at Slate Creek, Ariz., cost, ready to run, $1700, or about one-fourth of the cost of the whole plant. This included the small sheet-steel dust chambers, like those shown in the cut, which are very efficient and useful, saving probably as much as four-fifths of the dust that blows over. The secret of saving dust is to allow the fumes to cool as they pass through, whereby the gases are contracted in volume and diminished in speed, giving the solid particles an increased chance to fall, and also causing the volatilized substances to condense and attach themselves to the sides of the passage. Brick chambers, which do not radiate the heat away so fast, are less effective in saving the values, while they are considerably more durable. They require to be placed on the ground, where room often cannot be made for them. For large works I invariably recommend a combination of sheet-iron or steel chambers elevated above the feed floor, with brick ones resting on the ground. For small concerns serving the usual temporary purposes of country smelters the sheet metal ones amply suffice. Recollect that not only is the dust worth saving in itself, but it requires to be caught in order to keep it out of the machinery bearings, to which it is particularly destructive.

The grading of the two plants cost, if my memory serves, about $500 in each case, and the retaining walls perhaps an equal amount more. The latter are a necessary feature when building upon a sidehill, which is an ingrained practice among smelter builders. If we wish to profit by the superior advantages of the level site, which advantages are more apparent in large and complicated works than in the simple ones that we are describing, there will be a saving of the two items mentioned; but this is offset to a considerable degree by the expense of the elevating appliances which have to be installed. Even in the case of the sidehill system there must be some means for getting the foul slags up to the feed floor, but this in the case of the small plant may be merely a horse and cart working upon a graded rise. Wheelbarrows and even hand lifts are sometimes made use of for this purpose, but are out of the question when economy is strictly aimed at.

The water system around such a works is of great importance and should be given a good deal of attention. There will commonly be required a pump, a considerable amount of piping and a tank, all of which should be well set up and arranged for continuous use. The cost of the whole system in one case cited reached considerably over $1000, owing to the necessity of digging a number of wells. Nor was it much less in the other, as a lift of over 200 feet had to be arranged for, requiring a small electric transmission, with dynamo, motor and a substantial power pump. It often happens, though, that the necessary water supply can be obtained at much less cost. Running streams may be at hand to provide a gravity supply, or town or city mains may be drawn upon. In such a case the outlay on this account may reach but a few dollars.

The assay office, which is of vital importance in all smelting enterprises, represents usually an investment of from $500 to $1000 for apparatus, and an indefinite sum for the building. A good enough structure can be put up of lumber at a cost of $200 to answer all purposes, and an outfit costing $500 is good enough for any works if the articles be well chosen. There is no economy in cutting down the appropriation for assay goods, as practical smelting men well know. It is only the tenderfoot company that tries, to its grief, to get along with less than the laws of chemistry allow. In particular must the balances, chemical and assay, be of the best construction; for it is the balance that sounds the keynote of the metallurgical symphony, if I may use so mixed a metaphor.

The wagon, car, and other ore scales around such a works are quite an item in some cases, but of small cost at other times. Thus the Ivanpah works have a twenty-ton wagon scale, which I installed at an expense of $300, this being made necessary by the fact of the company using immense wagons, drawn by a string of twenty mules, who haul two wagons carrying a total of thirty-five tons of ore at a trip. On the other hand, the Slate creek smelter, using their ore as it comes from the mine in small hand pushed cars of about one ton capacity, finds it necessary to use only an ordinary wheelbarrow scale, costing $50. This implement answers also as a charging scale, performing quite as well as the more expensive, cumbrous and complicated many-beamed charging scales so commonly used. Two, or even three wheelbarrow scales, conveniently disposed about the feed floor, furnish a more economical method of weighing in the materials of the charge, inasmuch as the barrows do not have to be conveyed to a common point, and also as all the congestion of traffic at that point is avoided.

A blacksmith shop is an indispensable concomitant of a smelting works of even the smallest capacity, the tools and appliances being in constant need of repair. The smith must be a man of approved skill and ingenuity and will infallibly have need of all these qualities at times.

A complete outfit of the carpenter, blacksmith and machinist tools required around a plant of this kind may cost as much as $300, and more money may in a particularly isolated locality be profitably expended. If to this we add the cost of the necessary slag pots, matte pots, steel bars for working the furnace, and the other necessary small articles we will probably have a total of $500 at least, and it may be good economy to purchase to the extent of $1000 in order to be fully ready for contingencies.

The setting up of a smelting plant demands skill and care, but is not necessarily an expensive matter. If the details have been well studied and the working plans prepared with care the different parts of the plant will fit together satisfactorily and the work of construction goes on smoothly. Everything that can be made in the factory should be made there and the machinery set up before it leaves the shop, for the adjustment of steel and iron work is very troublesome and costly when done at isolated points, far away in the hills. I suppose that an allowance of $500 will cover the cost of erecting such a plant as the Slate creek, which went together exceptionally easy.

I use sometimes the Sturtevant fan blower, sometimes the Baker, Root or Connersville, according to whichever is best for the purpose. There is no great room for choice between them for most purposes, but I consider that the Sturtevant performs best in pyritic smelting, where the charge is commonly coarse and shallow. For fine ores, or where the slags are hard to melt, the rotaries give the best satisfaction. As for pressure, the fans when arranged for high pressures will reach about as high as any blower is expected to go. Doubtless the fan is the cheapest to run, taking less power for a given amount of air blown than the others, and if we add to this its flexibility, by which it is adapted to the driving of any sized furnace without altering speed, and its low first cost, it makes out a pretty good case for the fan. The fan differs from the rotary as two dynamos differ from each other when they are wound differently. One dynamo is wound for constant current with variable intensity; the other is wound for constant intensity and variable current. The fan gives constant pressure (intensity) with variable current; the rotary constant current with variable intensity. Knowing this and knowing the effects you desire to produce in the furnace you take your choice. There has been much discussion about the relative merits of fans and rotaries, and much prejudice, impossible, no doubt, to remove, exists in connection with the matter. For my part I can only say that fans have served me the best so far. A small furnace like those in question requires a No. 6 Sturtevant or a No. 4½ Root, the former costing $230, the latter over twice as much. As economy in first cost is supposed to be a prime object in these small plants I have inserted the former in my list of requisites.

Excepting as to the item of freight, which is omitted from the lack of definiteness, the sum represents very fairly the expense of constructing a good, solid and substantial smelter, suitable for dealing with a great variety of ores either by the matting, metallic copper or lead process. The inquiry does not deal with experimental plants, which may be put up cheaper, nor with permanent and durable constructions, which would be out of place in the interior mining regions. Such a works is capable of smelting from thirty to sixty tons a day of suitable

mixture, depending on the chemical and physical character of the material smelted. The slags which can he made may vary in silica—the ruling constituent—from 25% to 45%, from which the reader may deduce the composition of the mixtures which may he smelted.

Assemhling the different items which enter into the cost of a smelting works of the size and character indicated, we have:

Furnace	$1,700
Steam power plant	1,000
Blower and piping	300
Grading and retaining walls	1,000
Water system (assumed)	1,000
Setting up	500
Rock breaker, foundation, etc	350
Assay office and apparatus	700
Blacksmith outfit and other tools, steel, pots, car, etc	1,000
Charging scale	50
Planking ore dumps	200
Smelter building	400
Total	$8,200

In setting about to huild a smelter the first necessity is to get a true and accurate sample of the average ore of the mine, which cannot he done except with considerable lahor and care. It is of little use to send supposed average specimens of the ore to this, that or the other "expert" for his judgment as to the smeltahility of the whole mass of ore, for these specimens never represent—or at least never in my experience—the average of the whole mine. It doesn't matter how desirous an owner may he to get the thing right, he never gets it right until a large amount of his ore has been handled over and sampled as if for sale. Then, and not till then, has he accumulated the knowledge necessary to enable him to go ahead in a proper manner. First, then, move all the movahle ore and sample it carefully, the work heing done, of course, hy disinterested parties, for the owner is hound—such is human nature—to "salt" himself. Either from carelessness or from the self-salting tendency, or from both combined, the great majority of smelting plants are projected and even started off without these preliminary analyses, which are the life and hackhone of the whole proposition.

Having procured the samples and assays upon which the engineer's preliminary report must he based, they should be suhmitted to some qualified person, who will, hefore replying definitely, propose a numher of questions hearing upon the conditions surrounding the mine, as to its water and fuel supply and other matters. These answered, the engineer is now in a position to make recommendations as to the process to he used, the capacity of the plant to be installed, etc. After these have heen canvassed—and no such matter can he settled without a great deal of cudgeling to and fro—the next step is the preparation of the working plans. Whoever is entrusted with this part of the work should visit the locality and study its peculiarities, when, if he has the experience and originality which befit his office, he will be ahle to make such suggestions and adjustments of the project to the conditions that the future plant may possess extreme advantages and even he a model of its kind. The progressive designer never stops short in the march of improvement, hut finds material to his hand in even the most obscure and out-of-the-way locality. Even the smallest smelter should he the suhject of careful and anxious consideration, and should be planned separately from any other, for the local conditions invariahly make it worth while to introduce changes in apparatus from all preceding plants. A man is a poor designer if he huilds two smelters alike, never progressing from the huilding of one to another. The last word in smelter building is not yet, and never will he, said.

The Ore Crusher, Portland Mill, Near Colorado Springs, Colo.—(See Front Page.)

THE Portland cement industry has had a large and favorahle development in Michigan in the last few years. In May, 1901, ten factories were producing cement, and six others were in process of construction. The capacity of the ten plants is ahout 2,400,000 barrels of cement per annum. The capital stock of the Michigan Portland cement companies then organized is about $25,000,000, and their estimated capacity is, approximately, 8,600,000 harrels of cement per year. The total consumption of Portland cement in the United States during the year 1900 was hetween 10,000,000 and 11,000,000 harrels, and the amount manufactured was 8,500,000 harrels.

THE Russian petroleum output for 1901 from the three Baku oil fields was 80,945,247 barrels of forty-two gallons each. In 1900 the production was 72,018,743 barrels. The production from flowing wells accounted for 12,059,332 barrels in the total for 1901. Deducting loss and oil used for fuel, the net production was 71,583,401 harrels out of the 80,945,247 harrels. The average price for the year 1901 of the crude oil at the well per barrel of forty-two gallons was 32.67 cents; of residuum at Baku, per gallon, 0.91 cent; of refined oil f. o. b. on the Caspian sea, per gallon, 0.82 cent; refined oil in tank cars at Baku, per gallon, 1.1 cent. At the close of 1901 1354 wells were classed as producing and 1003 wells stood idle.

Australian Platinum.

By JOHN PLUMBER.

Although platinum is known to be more or less plentiful in New South Wales, the quantities at present ohtained are limited, the output in 1900 heing only 530 ounces, value £1007; and the total quantity raised since the heginning of 1894, 8295 ounces, value £12,432, the great difficulty heing the scarcity of water in the districts in which the metal is found. When this ohstacle has heen overcome, prospecting operations on an extensive scale will he found possihle. It usually occurs in grains or scales, sometimes in irregular lumps or nuggets, and rarely in crystals. A cuhical crystal of platinum found at Fifield, and now in the Sydney Geological Museum, measures nearly three-sixteenths of an inch.

The New South Wales platinum is ohtained chiefly from the Fifield district, about 322 miles west of Sydney, where it is found associated with gold. Here the principal workings are at Platina, a township situated about 2 miles from that of Fifield, a deep alluvial "lead," containing platinum and gold, extending from near the former place for over a mile in length, and varying from 60 to 150 feet in width. The sinking is from 60 to 70 feet, through loam, with some hands of harren quartz drift. The platinum and gold occur in fairly coarse waterworn grains, and, as a rule, are confined to the cavities in the bedrock, and to the washdirt for a few inches above it. Occasional nuggets of platinum have heen ohtained; the largest hitherto found weighs 27 dwt., and was purchased for the Sydney Geological Museum. There are two other nuggets in the Museum weighing 11 dwt. and 8 dwt. respectively. The washdirt contains from 5 dwt. to 12 dwt. of platinum, and from 1 dwt. to 3 dwt. of gold per ton. The yield from 269 loads, taken from a numher of claims along the "lead," was at the rate of 6 dwt. 21 grs. of platinum, and 1 dwt. 23 grs. of gold per ton. Platinum has also heen found in the Broken Hill district, and in many other places, likewise on the heaches of the northern coast, where it is ohtained from the auriferous sands. Here, the gold, platinum, etc., which are concentrated on the beaches during stormy weather, are hrought down by the action of the waves, from an ancient heach deposit, which occurs at an elevation of ahout 6 feet, and which has received locally the name of "hlack rock." This consists of a layer or bed of black sand-rock, composed chiefly of small zircons, with some grains of ilmenite (titaniferous iron), quartz, garnet and tinstone, also small but variahle proportions of platinum, platinoid metals and gold.

An Adobe Reverberatory Furnace.*

By JOHN GROSS, Sombrerete, Zacatecas, Mexico.

The building of reverheratory furnaces (fortschauflugsofen) where ordinary brick, firebrick and iron are comparatively cheap is quite a different matter from the building of such furnaces in isolated camps, where proper material is only to be obtained at high cost and with long delays. Time is always a large factor in metallurgical operations, and the metallurgist may find himself in a position where it hecomes necessary to erect apparatus and have it running in less time than it would take to obtain material from outside. It is here that he must make use of makeshifts.

In Mexico one of the most important of these is the all-useful adohe. Employed from prehistoric times, it still has its sphere of application in a surprisingly large numher of instances requiring an article that can he quickly and cheaply produced.

It is quite possihle to erect serviceable reverheratory furnaces with no other materials than adohes, stone and wood.

The old Mexican smelting shaft furnace was an example of what can he done with adohe, and the large numher of ruins of this class of furnace scattered through the mining districts of Mexico are silent testimony to the genius of a people who demonstrated their capahility of adapting material at hand to their needs.

The present paper will describe briefly the construction of an adobe reverberatory furnace which is giving good results, can he quickly erected at low cost, and, if properly huilt and handled, will last a long time.

The material being sun-dried, it naturally follows that the construction must be quite heavy. The adobes should he evenly made, with just sufficient straw to hold them together, and not too large in size—9 inches wide, 18 inches long and 4 inches thick is very convenient. The binding material should he of the same clay as the adobes.

The drawings explain themselves. Fig. 1 is a ground plan through the lower hearths, Fig. 2 a longitudinal section, and Fig. 3 a cross-section.

The furnace is douhle-decked, with three hearths on each deck and an auxiliary fireplace for the upper deck. It is designed for wood firing and chloridizing roasting, and is operated entirely hy manual lahor.

The ore is charged through a hole in the roof, worked in charges of 1200 kilos, and finally drawn through the last rahhling door into wheelbarrows, to go to the cooling floor.

Naturally, different ores and conditions would suggest other modes of huilding and manipulation, hut the object of this paper is simply to show this particular furnace as it is.

The hearths are 10x10 feet in size, with 3-foot walls, making the furnace 16 feet wide and some 41 feet long. The arch springs 9 inches above the hearth floor, and has a 12-inch rise.

The foundation is of stone, well built on a solid footing, and carried up to the first set of huckstay rods. These 1-inch iron rods are placed in pipes or channels, to prevent them burning out and to permit them to be easily changed if necessary.

The outside walls of adobe are now huilt up to the top of the lower skew hack, when the floor of the hearth, which consists of a "fire stone" set in clay, is put in. Each hearth is stepped a few inches lower than the preceding one.

The center (of dirt) for the arch is now put in and curved to templates. A 10-foot span of arch should not have less than 12-inch rise. When the center has been satisfactorily placed the skew back is cut and the arch is built of "arch" adohes, placed upright, using as little mud (made from the same clay) for joints as possible, and hammering adobes in place with a hlock of wood.

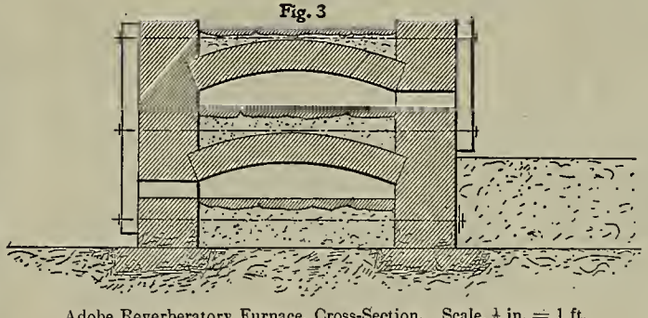
After the arch has heen well keyed the middle buckstay rods of 1-inch iron are placed in pipes just over it, and the walls are carried up to the top of the skew hack of the upper arch, the upper hearth floor is put in, the center is placed as hefore, and the upper arch is huilt of the same size as the lower one. The upper rods of 1-inch iron, just over the upper arch, need not be put in pipes; however, it is convenient to do so. The top of the furnace is paved with flagstones.

The huckstays of 10x10-inch timbers are now put on, the rods are tightened thoroughly, and the centers are removed by boys getting into the furnace through the firehox after this has heen cleaned out.

A light fire is started and kept going one day in the lower firehox, and then in the auxiliary one, the lower fire being increased. After three days of gradually increased firing, during which time steam and water are likely to appear in a few cracks, and the rods are occasionally tightened, a charge of ore is put on each hearth. The sulphur, soon igniting, will in a day or two, with proper firing, hring the furnace up to a temperature sufficient to hegin operations. Some four or five days more are required, however, hefore the furnace is properly heated, owing to the enormous hody of adohe work that must he hrought up to proper temperature.

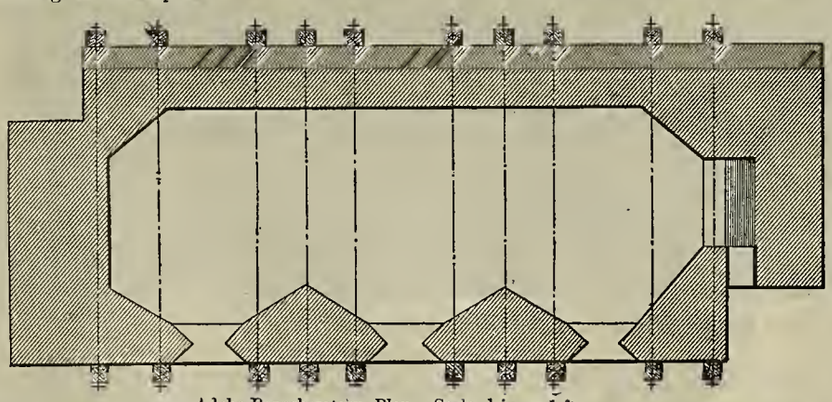
The rods must he looked after to see that they are kept tight, or, if they burn out, that they be replaced. The enormous weight of the arches will cause their gradual sinking, if not properly held, hut they sink very slowly and give ahundant notice.

Fig. 3



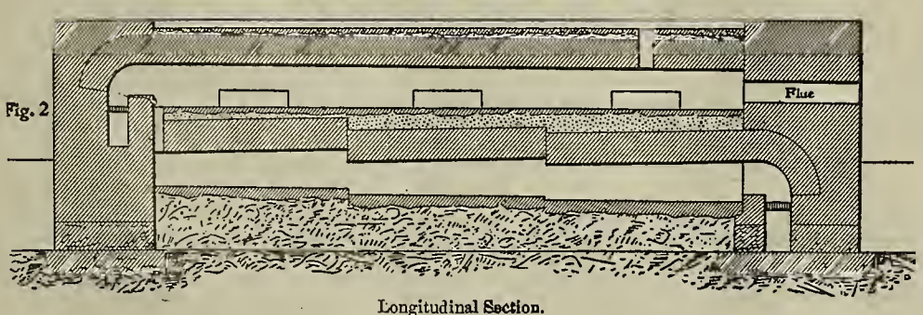
Adobe Reverberatory Furnace, Cross-Section. Scale, ⅛ in. = 1 ft.

Fig. 1



Adobe Reverberatory, Plan. Scale, ⅛ in. = 1 ft.

Fig. 2



Longitudinal Section.

*Trans. Am. Inst. Min. Eng., Mexican Meeting, November, 1901.

Crosse's Method for Determining Oxygen in Cyanide Solutions.

A Winchester quart is completely filled with the cyanide solution, the exact capacity heing known, and five or six grammes of solid caustic potash are added to decompose the douhle cyanide of zinc and potassium.

$$K_2 Zn CN_4 + 4KOH = Zn K_2 O_2 + 4KCN + 2H_2O.$$

After this, 100 c.c. of the solution are withdrawn for a preliminary test, and are titrated with zinc sulphate solution (200 grammes of $Zn SO_4$ 7ag. per litre), using phenolphtalein as an indicator, the zinc solution being run into the cyanide until the magenta color of the latter is just destroyed. The quantity of the standard zinc solution required for the bulk of the cyanide in the large bottle is calculated from this result, and the correct amount is added, without allowing air to enter with it, the stopper of the hottle heing replaced as soon as possihle.

The mixture of cyanide and zinc sulphate is then thoroughly shaken and set aside for the resulting heavy flocculent precipitate to settle.

The following reactions occur:

$$2KCN + Zn SO_4 = K_2 SO_4 + Zn CN_2.$$

$$Zn K_2 O_2 + Zn SO_4 + 2N_2 O = K_2 SO_4 + 2Zn H_2 O_2.$$

$$2K_4 fe CN_6 + 3 Zn SO_4 = H_2 Zn_3 Fe_2 CN_{12} + 3K^2 SO_4.$$

$$2KOH + Zn SO_4 = K_2 SO_4 + Zn H_2 O_2.$$

The clear liquid is then siphoned off without undue access of air by using a bent glass tuhe passing through one hole of a douhly perforated cork fitted into the bottle; the second hole carries a short glass tuhe (arranged as in a washing hottle) through which water is hlown momentarily to start the action of the siphon. The end of the immersed limh of the siphon is covered with a small hag of lint, which filters off any floating particles of precipitate. Two or three (290 to 300 c.c.) pipettes full of the siphoned solution are drawn off and retained. These pipettes have a glass stopper ahove and a stopcock helow, with a tube 3 or 4 inches long helow the stopcock. A preliminary test of the iodine absorhing power of the solution (due to unprecipitated douhle cyanides) is then made hy adding to a quantity equal to that used in the test, 0.9 c.c. of sulphuric acid (half acid, half water) and a few drops of potassium iodide and starch. Dilute hromine water (1 hromine water, 2 water) is added until a hlue color is ohtained. Another pipette full of the liquid is now taken, 0.9 c.c. of sulphuric acid and the required amount of bromine water (found from the preliminary test) are added, and the pipette is turned over several times. One c.c. of a solution containing 20 grammes potassium iodide and 0.5 grammes of sodium nitrite to 100 c.c. of distilled water is then added, and the pipette inverted a few times and left to stand for fifteen minutes to enahle the reaction to take place.

The stopper is then placed in the wide-mouthed hottle described helow, coal gas is passed for a few minutes until it hurns at the exit tuhe, the cyanide solution is allowed to run in from the pipette, and the free iodine, freed in proportion to the oxygen in the solution, is finally determined by means of standard sodium thiosulphate solution. If this solution contains 7.75 grammes of pure crystals of thiosulphate per litre, then 1 c.c. corresponds to .25 milligram of oxygen.

The equations are:

$$2HT + 2HNO_2 = T_2 + 2H_2 O + 2NO.$$

$$2HT + O = H_2 O + T_2,$$

the nitric oxide acting as a carrier of oxygen.

The wide-mouthed bottle mentioned above is of ahout 500 c.c. capacity, and is closed with a caoutchouc stopper having four perforations. Through one the cyanide solution is run in from the pipette. Two others are for the entrance and exit of coal gas, which is used to drive out all the air. The fourth is for the passage of a glass tuhe drawn out to a point at its lower extremity and connected ahove hy means of a few inches of rubher tuhing with the hurette containing the thiosulphate.

The addition of sulphuric acid, hromine water and the solution of potassium iodide and sodium nitrite are made in the cyanide solution in the large pipette hy means of small hand pipettes, and corresponding quantities of the cyanide solution are displaced when the stopper is replaced. One c.c. of starch solution is added to the wide-mouthed hottle through the stoppered pipette when the titration is nearly finished.

The estimation is interfered with hy the presence of nitrites in these mill solutions and a correction must he applied. To make this correction, pour into a very strong 350 c.c. flask a quantity of solution equal to that used in the experiment (say 293 c.c.), add a few drops of potassium hydronide, and close the flask with a rubher stopper, having one perforation, through which is passed a glass tuhe with a glass stopcock. Boil the solution for a few minutes and close the stopcock. Cool the flask and when

cold pour the liquid into the pipette and add the bromine solution, acid and 1 c.c. of iodide and nitrite solution as before. Then let it stand for ten minutes and in the presence of coal gas, run it into the wide-mouth bottle described already, add 1 c.c. starch and titrate with thiosulphate. The quantity required gives the correction for nitrites and for the reagents, as the same amount of acid and of iodide and nitrite solution is used in each case.

The only other correction is for the oxygen dissolved in the thiosulphate solution, which corresponds to about .03 c.c. of thiosulphate per c.c. added. By this method the amount of oxygen per litre in certain cyanide solutions was found to he:

Solution pumped in leaching vat	6.3 mg.
The same solution running from vat after thirty hrs.	0.6 mg.
The same solution from end of zinc boxes	0.3 mg.

A Ship of the Desert.

Written for the MINING AND SCIENTIFIC PRESS.

The idea of a ship of the desert has heen so long a figure of speech—the weaving of romance and imagination about the dromedary and his navigator, the nomadic Arah of the Sahara—that the real thing depicted in the illustration accompanying this, though a thing of beauty, will bring to the mind a sense of regret at an illusion that must vanish. To one who knows from close association both the real ugly heast of a camel with his unpleasant master, and the graceful machine here pictured, the disillusionizing process leaves no disappointment.

Like many other unhelievable things, both natural and the development of art, this novel structure is a California production. It sails on the Mohave desert. This desert, too, is as unlike the thing created by one's imagination as are most things Californian. It has a river—the Mohave—which is heing harnessed to water wheels to make power and light—which could very appropriately be called "The Light of the Desert"—and, after making power and light, used for irrigation, makes the sands fruitful of oranges and pomegranates. This Mohave desert has a covering of snow in California's pretense for winter; a carpeting of flowers, to the vivid hloom of which distance gives the effect of a field aflame, in spring time. It is noisy at times with the twittering of hirds, and every desert hush hides a mouse or a rahhit. Still, with these desert surprises and antithesis, it has in a long dry summer of mirages, horned toads and rattlesnakes, and summer is not the season for pleasure journeys on the desert.

The Mohave desert has a wealth in mines, lightly touched as yet, and still to he found hy that mining pioneer, the prospector. The new ship of the desert is really a mining apparatus devised to he lahor-saving and more economical than the burro that it is expected to displace for transportation. The new ship of the desert has the wind for motive power, where the burro must he fed and provided with a water supply, always short and never convenient. Two tenderfoot miners, the Hoyt hrothers, of Cleveland, Ohio, brought the idea out with them—douhtless getting it from the ice boats used hack there in the winter navigation of Lake Erie—and huilt it at their new home at Rosamond, Kern county, to carry them back and forth daily to their mine, 9 miles away, a service it performs without the "bucking" that attends on continuous service from the burro.

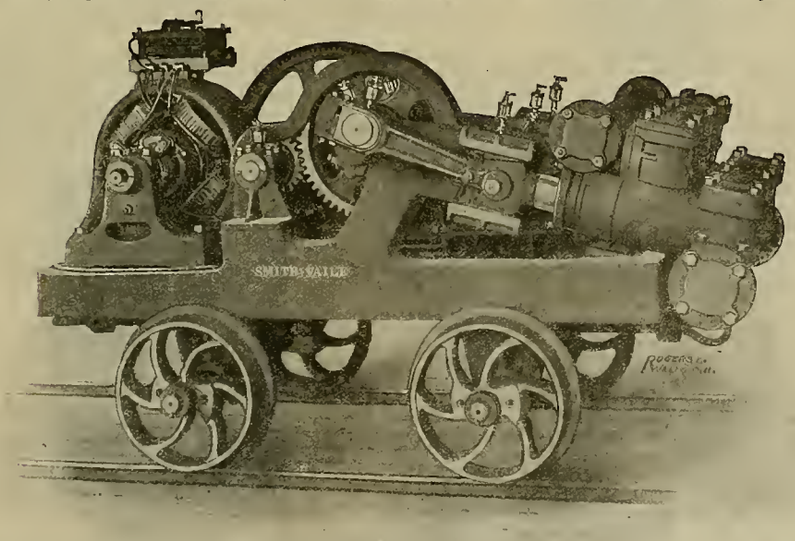
The illustration shows the manner of construction employed. This one is 14 feet long, with 8 feet heam at the bows, tapering to a sharp run aft. The mast is 15 feet high from the front axle to the truck. The main boom is 10 feet long and the mainsail has a hoist of 10 feet in the throat. Perhaps it should he explained that, though the desert ship holds water, which it carries, it is not the throat of the mainsail which gets dry.

The first of the kind, it is, like all beginning, small and made from the materials at hand. The wheels would run easier with hall bearings; hut, even without this, the speed developed seems all that is desirahle. The winds hlow strong on the desert and lift the hoat along with the speed of a California railroad train. The vessel is a good load carrier, as the numher of passengers shown in the illustration will indicate.

Mine operators in Arizona and New Mexico, as well as in the Mohave desert, will see economic possihilities in this load-carrying feature of the desert ship. It offers a possihle solution of the mine transportation problem to them. Pack transportation by hurros, wagon transportation by horses and railroad facilities are all more costly than that afforded hy the desert ship when the desert winds blow.

Copyright, 1902 by John L. Von Blon, Los Angeles.

A Ship of the Desert—"The Desert Queen"—A New Means of Transportation on the Mohave.



Smith-Vaile Electric Triplex Truck Pump.

Triplex Pumps.

Herewith is illustrated a horizontal electric triplex mine pump, size 4x6, to pump to 350 feet, 150 pounds pressure. The plungers are single acting, outside packed and outside guided, and with water cylinders, valve chambers, gears, etc., are mounted on an iron truck, providing a compact and rigid machine. The crossheads have adjustable shoes; the connecting rods have bronze boxes at crankshaft connections, with key adjustment; the gears are machine cut and provided with guards; close and direct connection is made to motor. It is manufactured by the Stilwell-Bierce & Smith-Vaile Co., Dayton, Ohio, who will promptly furnish any detailed information desired.

THE U. S. Geological Survey reports that the production of flint in 1901 amounted to 32,740 short tons, valued at $133,298, which was a slight increase in quantity over 1900, hut a decrease in value. The feldspar production showed a decided increase, the total quantity mined being 34,742 short tons, valued at $121,422, which shows a decrease in value of $52,237. This is partly accounted for by the fact that in 1900 91% of the output was ground by the producer, while in 1901 only 7% was so treated. The production is used principally in the manufacture of pottery and chinaware, most of it being marketed in New Jersey and Pennsylvania.

Stamp Battery Block Foundation in Soft Ground.

Written for the MINING AND SCIENTIFIC PRESS by W. H. WASHBURN.

In carrying out the details of mining operations in their various branches, it sometimes becomes necessary to modify or change the methods generally in use. In this way the desired result is often reached, when a strict adherence to the usual practice might result in at least a partial failure.

We do not mean by this to belittle tried and established methods, but simply to recommend adapting the means to the desired end, where the usual practice would probably fail. As an instance of this a recent case may be quoted, in which the writer had to place a set of mortar blocks for a 25-stamp mill on what is known in Oregon as webfoot.

For the information of those of your readers who may not know what is meant by webfoot, it may be stated that it is a sort of indurated clay, probably of volcanic origin, and is readily reduced to a soft mud when wet by even walking back and forth over it. It will be seen that a wooden mortar block, set upon it in the usual way, would be most likely to soon work loose and settle, perhaps, continually, while the mill was in operation.

It was expected when the pits were begun that a porphyry dike, which from the surface appeared to dip toward them, would be found at a less depth than 20 feet. Had this expectation been realized, we should have put the mortar blocks down in the usual way on the solid foundation it would have afforded; but, after going down 20 feet and driving a steel bar still farther, it was evident that the dip of the dike had become more vertical, and something had to be done to meet the situation.

It was then decided to enlarge the bottom of the pits and lay down a platform of timbers upon which to place the mortar blocks proper.

The pits for each section of ten stamps were 3′ 2″ wide, 13′ 2″ long and 20′ deep, that for the 5-stamp section being correspondingly shorter.

Beginning about 3 feet from the bottom, each pit was undercut at an angle of about 45° to a point level with the bottom and undercut about 1 foot at the ends.

A layer of sand about 2 inches thick was spread over the bottom, and upon the sand a row of timbers 10″x12″x7′ 6″ were laid crosswise one by one and well pounded down on the bed of sand, tamping it well underneath when necessary to make them level and true. They were toe-nailed together with about six 8-inch spikes in each sill as it was laid down, and short stulls were put in from the roof of the undercut down to the ends of the timbers, to prevent the incoming water from floating them up out of place. After making sure their upper surface was level and smooth, both lengthwise and crosswise of the pit, three timbers, each 10″x12″x14′ long, were laid lengthwise upon them and well spiked and bolted down. A thin layer of mortar, made of freshly slacked lime, without sand, was laid between the two rows of sills, with the intention of preserving their adjoining surfaces from decay, as well as to keep the tamping sand from working in between them.

A series of 2-inch plank of different widths, as shown in the accompanying drawing, were then spiked lengthwise alongside the top row of timbers, as a further precaution against the sand getting between the timbers, as well as an additional binding to the whole platform. A temporary covering of boards was then laid over the top and the platform well tamped with sand up to within about 2 inches of the top.

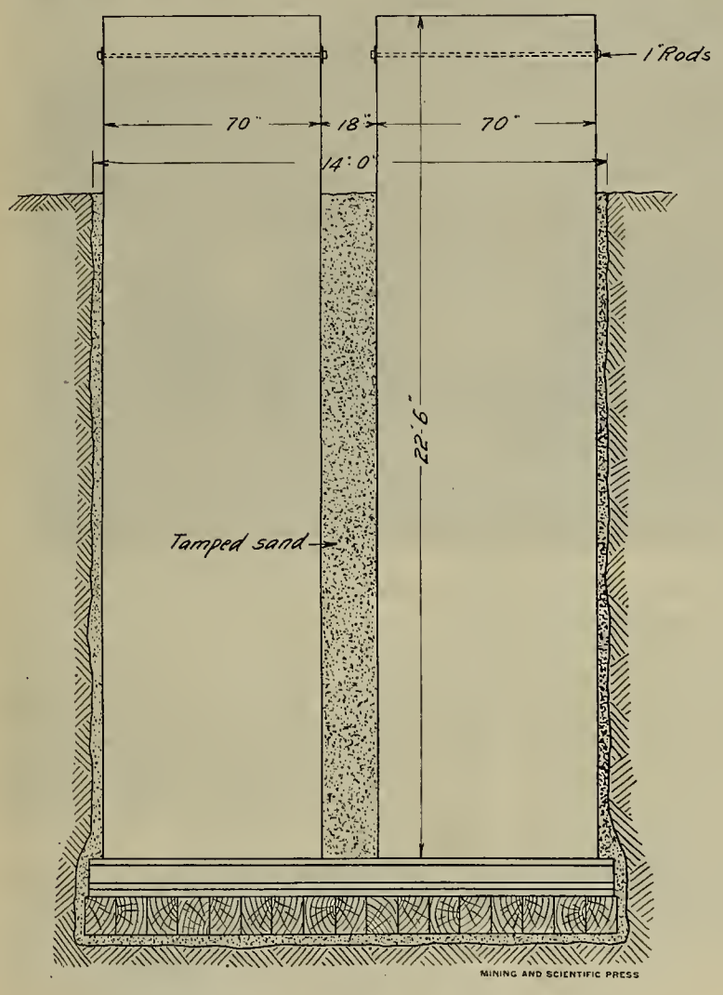
The temporary covering of boards was then removed, the upper surface of the timbers made level and smooth and the platform was ready to receive the mortar blocks. These were built of 2½-inch plank, 24 feet long, one layer being of three planks, each 10 inches wide, and the next of two planks, each 15 inches wide, in alternate layers. The planks were sized by a planer to an even thickness and width and their lower ends squared. A derrick and tackle was rigged over the pit and used to hoist and lower the plank in place. Lime mortar, the same as before, was used under their lower ends. They were well spiked together from the bottom to the top and toe-nailed to the platform with 60d spikes, care being taken not to have the spikes interfere with the space required for the anchor bolts or their pockets, as well as the binding bolts through the upper end of each block, as shown in the drawing.

The surrounding space was then thoroughly tamped with sand, the upper ends of the blocks sawed off and dressed off level, and the whole job was done, so far as the mortar blocks were concerned.

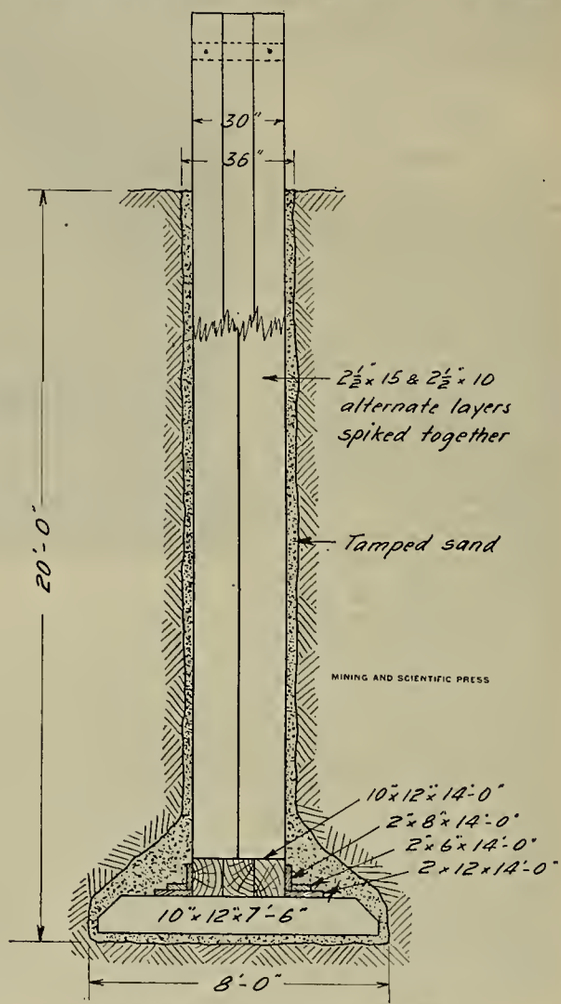
In dressing off the top of the blocks, they were made slightly concave, or about $\frac{1}{16}$-inch lower in the center than at the ends, to prevent any tendency toward rocking on the block in the future—a practice which has proven successful, so far as we have been able to observe, as when a mortar does work loose on the block it generally begins by rocking endwise.

A layer of felt about 1 inch thick was placed between the mortar and the block, which seems indispensable in order to prevent sand or dirt from working in beneath the mortar and causing a rapid wearing away of the wood, a result we have seen to follow when they were set without it.

Before the mill was started up the blocks were marked with reference to the sills around them, and, after the mill had been run three weeks, there was no sign to detect that they had settled as much as $\frac{1}{16}$ of an inch and they were perfectly solid when the mill was running. We venture the opinion that where wooden mortar blocks are used in any case, it would pay to have them not less than 20 feet long, instead of 14 feet or 16 feet, as they are often made, as the inertia of the longer block will absorb the greater part of the blow, instead of transmitting it to the ground upon which it rests.



Webfoot Foundation for Stamp Battery Blocks; Front Elevation.



Webfoot Foundation for Stamp Battery Blocks; End Elevation.

The A. C. Bates Rock Drill.

The A. C. Bates rock drill herewith illustrated is a simple, light and effective hand rock drill. In the operation of it, by turning the handle, the drill is twisted and drawn to its stroke, which is 1½ inch, and driven into the rock by means of a heavy spring. If the drill sticks in the hole, the twist is released and the drill drawn to its stroke. The manufacturers claim it will do rock drilling by hand power easier and quicker than by the old style of single or double hand drillers, and that it can be operated by a boy, laborer or miner, requiring no special skill to use it.

The Bates Rock Drill.

The spring is made adjustable for light or heavy blows. It can be quickly taken down and set up by one man. Drills used in ordinary hand work can be used in the machine. If desired it can be connected

up and run by electrical power. The machine, set up ready for work, weighs 125 pounds. It is claimed that the air cushion, automatically formed by each blow, effectively takes all jar and concussion from the machine frame and operator, and protects the machine from breakage when not properly fed.

One hundred and fifty blows are struck per minute, under average speed by hand power (two blows being made by each revolution of the handle). All parts are interchangeable, so that any part may be replaced from stock when worn out. The leather washer between the spring and adjustable cap at end of machine tends to prevent crystallization of the spring and adds to its life. Otherwise the manufacturers say there is nothing in the working parts but what a miner at his forge may repair.

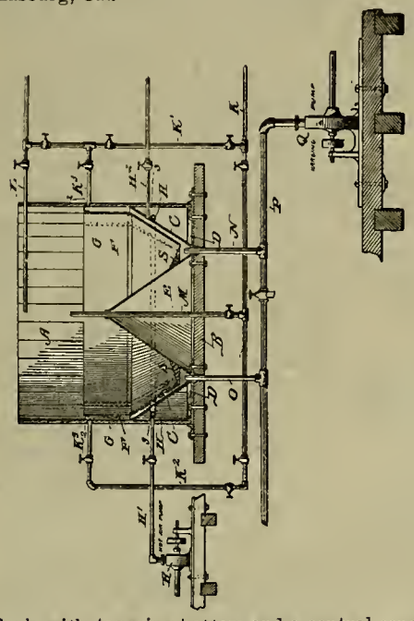
Griffitts & Howlett, 85 Fremont St., San Francisco, Cal., the manufacturers, will give further information regarding this rock drill.

Mining and Metallurgical Patents.

Patents Issued April 22, 1902.

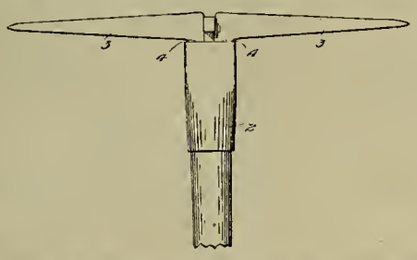
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

CYANIDE TANK. — No. 698,016; J. J. Hervey, Randsburg, Cal.



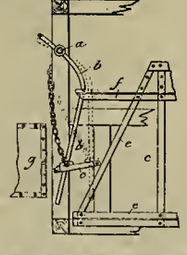
Tank with tapering bottom and a central cone arranged in connection with bottom, annular lining arranged in tank and open at lower end, filtering screen connecting the lower end of lining and central cone, air and water pipes, charging and discharging pipes, and forcing means connected with pipes.

PICK.—No. 698,147; E. A. Smith, Fowler, Colo.



A pick eye having polygonal opening and transverse ribs on interior end walls of opening, pick points having shanks polygonal in cross section adapted to opening and formed with grooves to engage ribs, and wedge driven into opening between shanks and spreading them apart and holding grooves of shanks locked to ribs of opening.

SELF-CLOSING DOOR FOR MINES.—No. 698,275; F. Gunther, Recklinghausen, Germany.

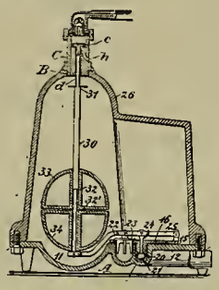


Curved inverted U-shaped bar, pivot bolts connecting it near upper end to timbers of mine level adjacent to shaft, guides on sides of level, foot bar connecting lower ends of U bar, cross rod supported upon timbers above foot bar, chains connecting rod and foot bar.

SUBMARINE GOLD SAVING DEVICE.—No. 698,105; L. D. Craig, San Francisco, Cal.

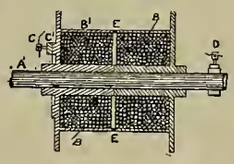
Open trough, series of riffles arranged transversely therein, rods secured within trough above riffles, cutter carried by trough for separating material during movement of trough and means by which trough is propelled.

HYDRAULIC AIR COMPRESSOR. — No. 698,236; J. Weyand, Guttenberg, N. J.



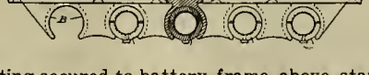
Shell provided with water inlet and outlet openings, lever pivoted within shell, valves attached to lever and controlling openings, vertical rod pivoted to one end of valve lever, and floats movable up and down upon rod in combination with valve tube provided with air delivery and air vent nipple forming continuation of delivery channel, flexible apertured jacket covering nipple nozzled cap surrounding and valve controlling air vent with hollow stem adapted to slide over float rod and capable of closing delivery outlet by contact with upper one of floats.

ORE CONCENTRATOR.—No. 698,293; C. M. Kimball, Port Huron, Mich.



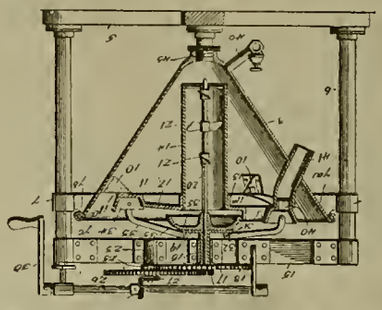
Open tank having settling trough with generally imperforate bottom located within its upper portion, means also within tank for circulating water and tailings from lower part of tank to trough, and means for moving tailings which lodge in trough along the bottom thereof, tailings outlet from trough extending through outer side of tank, whereby gold or other heavy material will remain at bottom of tank while tailings will be elevated into trough, and automatically and continuously removed therefrom while water overflows from trough into tank.

GUIDE FOR STAMP STEMS.—No. 698,378; D. C. Demarest, Angels Camp, Cal.



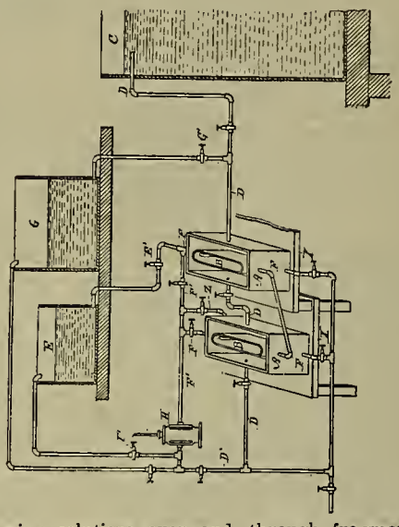
Casting secured to battery frame above stamp or line of stamps, and formed with tapering socket or opening through casting above each stamp and with passage through front wall of each socket for lateral admission or removal of stamp stem, sectional tapering sleeve or shell fitted around each stem and adapted to fit and seat itself in socket in casting, and lug on sleeve or shell adapted to project through opening in front of socket.

MAGNETIC SEPARATOR.—No. 698,311; J. H. A. McPhee, Dunedin, New Zealand.



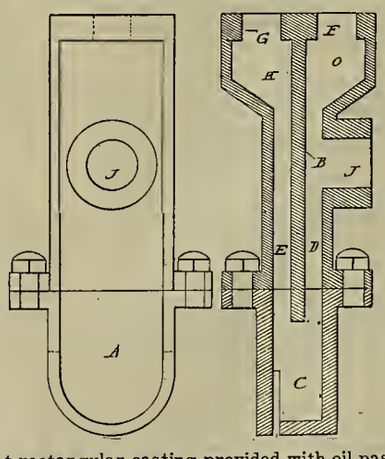
Pulley consisting of a core and shell surrounding same and integral therewith, magnetic coil wound upon core and extending to inner face of shell, shaft extending through core for supporting and rotating pulley, suitable electrical connections for coil, insulated means for dividing pulley in sections, belt operated by pulley and adapted to receive and separate material, means for supplying material to belt, and for operating pulley in rotary direction and to impart transverse movement to pulley while it is rotating.

PROCESS OF RECOVERING METALS. — No. 698,292; E. D. Kendall, New York, N. Y.



Flowing solutions over and through fragmental mass of carbon presenting large surface area, and which carbon mass serves as cathode, plate of carbon immersed in solution of potassium or sodium hydroxide serving as anode, which solution of potassium or sodium hydroxide is separated from cathode solution by porous diaphragm, whereby cyanogen set free by electric current is reconverted to alkali cyanide, subjecting flowing solution to action of electric current having electromotive force of five volts' strength or more, next stopping flow of dilute solution and flowing over and through fragmental carbon mass stronger solution of potassium cyanide and then subjecting deposited metal to action of reversed electric current not exceeding electromotive force of five volts, using carbon mass as anode and plate of metal for cathode.

OIL BURNER FOR FURNACES. — No. 698,361; W. Booth, San Francisco, Cal.



Flat rectangular casting provided with oil passage and adjacent steam passage, separated by partition; nosepiece bolted onto casting in front of partition, interior of nosepiece forming chamber, horizontal floor in chamber and slit in forward end of nosepiece in line with floor of chamber.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

COOK'S INLET.

The Big Horn M. Co., owning placer claims at Sunrise City, is preparing to do extensive hydraulic work this summer. President and General Manager A. R. Ommanney is in personal charge of operations. The line of the Alaska Central railway from Sunrise City will cross ground belonging to the Big Horn Co.

JUNEAU.

Preparatory work for the construction of the tunnel at Juneau has been completed and construction will commence about August 1st. The tunnel will be nearly 8000 feet long and will tap a series of quartz claims at a depth of 800 feet in Silver Bow basin, back of Juneau. The tunnel is being driven by the London Exploration Co.

KOYUKUK.

Busby Bros., owning Discovrey, on Hammond river, Koyukuk district, have picked up a nugget from their claim valued at $822 50, figuring at $17 an ounce. The men on No. 1 above Discovery, on Hammond river, are taking out their dump and are picking up in nuggets from $30 to $60 a day. Further up the creek, men have been trying to sink holes down to bedrock, but are unable to do so, owing to water coming in about 12 feet down.

NOME.

Since the summer of 1900, investigations of the tundra deposits near Nome bave been pursued under J. U. Picard's direction for a New York company. Picard says the company now owns eleven 160-acre tracts between Nome and Penny river, and that in 1901 and this winter he has sunk a number of prospect holes to bedrock, using a Keystone boring drill. The depth to bedrock varied from 40 to 80 feet, and the gravel, which begins about 8 feet below the surface, is not frozen. The surface deposit, about 8 feet in depth, consists mostly of peat, which can be used for fuel for the machinery necessary to work the tundra on a large scale. The gravel deposit under the peat contains gold. In one hole gravel averaging $4 87 to the cubic yard was found at a depth of 42 feet. In another hole sunk it averaged $3 64; in another, $6 10, while still another showed an average value of $5, and one reached $12 41. The lowest average to the cubic yard was $3 64. In prospecting the bottom of the sea in front of Nome, at a depth of 10 feet, Picard reports finding $7 to the cubic yard; at 30 feet, $11 25. The lowest value found was $2 to the cubic yard. The company is to work the tundra deposits on a large scale, commencing in the summer of 1902.

VALDEZ.

Development work on Latouch Island, near Valdez, has shown up a copper ore-bearing vein for a distance of 5 miles. On the Bonanza claim a slide exposes the vein for a distance of 300 feet in length and 200 feet in height.

ARIZONA.

COCHISE COUNTY.

At the Black Dismond copper mine, near Pearce, Manager N. O. Bägge states tbe company is waiting on the construction of the smelter so as to begin turning out copper bullion. A telephone system connecting the mine with Pearce has been installed. The 200-ton smelter is expected to be ready for operation by August 1st. The construction is in charge of C. C. Leary.

GILA COUNTY.

Supt. F. W. Hoar of the Old Dominion M. & S. Co., at Globe, says that while final plans are not completed, it may be stated generally that changes and additions to the present plant will be made to increase the output of copper and reduce the cost of production. The first improvement to be added will be a briquetting machine to utilize the flue dust, of which there is a large accumulation at the smelter.

The Pinto Creek M. & S. Co., operating north of Globe, has installed a gasoline hoist and is considering the putting up of a 10-stamp concentrating mill. A large body of rich ore has been opened and a depth of 330 feet reached.

GRAHAM COUNTY.

The Stevens Copper Co. are operating the Stevens group of thirty-five claims, near Metcalf. These claims lie on the western side of the mineral zone. The ore—carbonate and oxide—is found in a contact vein between porphyry and lime, capped by iron. The dyke is several hundred feet wide and shows on the surface about 6000 feet. The company is extending the main tunnel, now in 570 feet, to crosscut the veins, and will open up the property 400 feet down. It is intended to put in air drills and possibly a small smelting plant.

MARICOPA COUNTY.

The Mountain Chief group of mines in the Harqua Halas, about 40 miles west of Wickenburg, lately bought by Eastern people, is now being developed and opened up by the new owners, with W. E. Defty as Supt. A whim has been installed and one shaft is down 100 feet, with 3 feet of high-grade gold-copper ore showing in the bottom of the shaft. Another shaft is to be started.

The Oro Grande Extension M. Co. has been incorporated at Phœnix, with G. B. Upton, G. E. Sanders, D. S. Michelsen, A. Smitu and A. Childers directors—all of Wickenburg. The company is to operate the Oro Grande Extension group of eight claims adjoining the Oro Grande mine, near Wickenburg.

MOHAVE COUNTY.

P. White and associates have located several claims near Kingman, ores from which show gold, and assays over $20 a ton. The locations are about 6 miles from the Colorado river.

SANTA CRUZ COUNTY.

The Buena Vista properties of fourteen claims are 12 miles east of Nogales. The company has over 12,000 feet of development work, and bas recently installed an electric drill. The work on the Buena Vista claim shows a ledge which averages 5 feet in width, running 6% copper. F. N. Cox is Supt.

YAVAPAI COUNTY.

Switzer & Ratcliffe have sold for $55,000 their mining properties in Copper Basin, at Skull Valley Station, near Prescott, to the Oro Cobre M. Co. They consist of two groups of seven gold quartz claims. A water right hss been bought in connection with the claims and the company will soon commence development work.

A strike is reported in the Cliff mine, owned by the George A. Treadwell M. Co. at Jerome. Assays of the 22 feet of ore struck run from 8% to 25% copper.

D. Kyle, Supt. of the Oro M. Co., in the southern Bradshaws, says the Oro group was formerly known as the Boaz and was equipped with a 20-stamp mill with fifty tons daily capacity. This is being increased to 150 tons, and a cyanide plant that will treat 150 tons daily is being added.

Ten stamps are to be added to the Val Verde smelter plant at Val Verde and the number of rolls increased so as to make the capacity of the plant 100 tons a day.

The Poland M. Co. has bought the Middleton, Cash on Delivery and Independence mines, located in the vicinity of the Poland mine, near Prescott, from J. Robeson of Prescott, S. G. Miner of Phœnix and L. English of New York, for $11,000.

CALIFORNIA.

AMADOR COUNTY.

The 800 and 1400 levels at the Bunker Hill mine, near Amador, are being driven and the 200 level is being run from the shaft to connect with the Mayflower tunnel, so that the water will only need to be pumped to this point instead of to the collar of the shaft. The 1400 levels are in low-grade ore, said to be improving.

The Edinburgh G. M. Co. has been incorporated in San Francisco, capital $200,000, by D. Fisher and others to operate a quartz mine near Wieland, which is on the east belt of the mother lode. D. Fisher is Supt. A contract has been let to drive the tunnel 500 feet farther along the vein. The ore carries 3% of sulphurets, which assays $55 per ton. Drillings taken from clear across the veiu assay $7.50 per ton in free gold.

The Original Amador mine at Amador City, which has been shut down for eighteen years after it was explored to a depth of 1400 feet, is about to be reopened by Eastern peop e who have taken hold of the property.

CALAVERAS COUNTY.

S. W. Payne of San Francisco has bonded three claims at Esmeralda, on which a water power arrastra has been operated for a number of years with profit. One vein of ore developed is 4 to 6 feet wide and will go $5 to $7 to the ton; another vein 3 feet in width, it is claimed, will run $40 to $45 to tbe ton; and ore from a third vein, it is claimed, has yielded $70 to $75 to the ton in the arrastra.

The hydraulic claim on North Hill, near Jenny Lind, is to be operated with water from the reservoir in Salt Spring valley. The gold is coarse and pieces are found going as high as $40.

B. K. Mauna has sold the Sparrow Hawk and Never Thought quartz mines at Jesus Maria to Haywood & Hamilton of San Francisco.

The French Hill quartz mine at Jesus Maria has been bonded for four months at $5000 by F. O. Cortmarsh.

EL DORADO COUNTY.

The Mount Pleasant Con. G. M. Co. has been incorporated with office at San Andreas to operate the Mount Pleasant quartz mine properties at Grizzly Flat. The directors are J. Lavaggi, Plymouth; H. G. Stevenson, Menlo Park; A. M. Brown, Placerville; H. P. Morgans, Angels Camp; F. J. Solinsky, San Andreas.

KERN COUNTY.

The Mojave Copper Co. has bought thirty locations near Mojave for $10,500. The company proposes to begin active development work at once.

MONO COUNTY.

The Golden Gate M. Co., at Coleville, I. W. Geary Supt., has struck the ledge in the new workings. It is in a broken-up quartz, assaying very high.

NEVADA COUNTY.

Tbe msjority of stock in the North Bloomfield M. Co. has been sold to the W. B. Bourn Co. for, it is said, more than $300,000. It is said the new owners will erect an electric power plant and transmit power to San Francisco. The property embraces the North Bloomfield hydraulic mines, the Kate Hayes mines at Badger Hill, San Juan, Sweetland and French Corral, nearly 100 miles of ditches and canals and the Bowman and Pine Grove reservoirs. J. W. C. Maxwell continues as president of the company and G. W. Starr has been made general manager.

It is reported that the Niagara mill, at Nevada City, will soon be started up, only the tramways requiring to be finished.

PLACER COUNTY.

At Forest Hill work is being done, retimbering in the old Baltimore mine, to put it in shape to be operated. This claim is owned by Mrs. S. E. Reamer of Oakland.

The tunnel at the Red Point drift mine at Westville is now in on the channel 3½ miles. The quantity of water which flows from the mine is 70 cubic feet per minute.

SACRAMENTO COUNTY.

The Folsom Con. Co. has been incorporated, capital $100,000, in San Francisco, with D. P. Gray, A. T. Eastland, A. L. McPherson and J. A. Britton, all of Oakland. The company will operate mines at Folsom.

SAN BERNARDINO COUNTY.

It is reported that a large deposit of nitrate of sodium and potassium, located at the south end of the Slate range of mountains, is to be exploited by English people, their representative being now on the ground to make an examination of the deposit.

SAN DIEGO COUNTY.

The Noble mine, at Julian, has been bonded by Noble Bros. to J. H. Thring of London, Eng., at $30,000. There is a 10-stamp mill on the property.

The American Girl mine, near Ogilby, has been sold to the American Con. M. Co. for abnut $1,000,000 by H. H. Markham, A. R. Dodworth, G. H. Coffin, F. S. Daggett, W. Wotkins and J. W. Wood of Pasadena. The buyers are Denver, Colo., and Chicago, Ill., people.

The Ranchita group of mines, at Julian, are being put in shape for thorough development. Water is being piped in for the use of the mill and the old shaft has been cleaned out. Sinking in new ground has commenced.

The Stonewall mine, at Julian, now owned by a stock company, is having new shafts and tunnels opened, and several bodies of ore that are in sight will be worked.

SHASTA COUNTY.

W. P. Miller, owner of the Josephine mine, near Redding, has sold the stamp mill on the mine and it will be shipped to Hornbrook. The ore in the Josephine mine is refractory and the values can not be saved by milling and concentrating. The mine will be further developed and the ore shipped to the Keswick smelter.

J. J. Chambers of Redding is preparing to build a custom smelting plant at Kennet.

The Gladstone mine at French Gulch, owned by J. H. Roberts of Sacramento and I. O. Jillson and L. A. McIntosh of Chico, is to have a 500 H. P. electric plant which will be used to run the mine and mill and light the entire plant.

The Fair View M. Co., operating near French Gulch on the top of Trinity mountain, is making a wagon road to the mine. J. H. Porter is Supt.

SIERRA COUNTY.

Operations are to be resumed at the Alaska mine, at Pike City, this summer by a new company. The plan is to drive a 6500-foot tunnel from Oregon creek to tap the ledge at a depth of about 1500 feet, far beneath the old workings, which were abandoned because of an inflow of water. The power to be used will be electricity, which will be obtained from the Plumbago power house.

SISKIYOU COUNTY.

The Brokaw, Lewis & Co. mine in Hull gulch, near Oro Fino, has started up after being closed down for several weeks on account of a broken pump. The mill has been started crushing ore.

The tunnel at the Cherry Hill mine, near Fort Jones, is now in 1100 feet. A 30-inch blower has been installed to draw the gas and bad air from the works, and an air receiver placed inside the tunnel at the 1000-foot market. The 10-stamp mill is running on ore taken from the upper works.

TRINITY COUNTY.

The Bob's Farm M. Co., in which W. H. Montgomery of Trinity county and J. A. Byers of Colusa county are interested, has seven claims 45 miles northwest of Weaverville, the best developed being the Wild Denver. No. 1 tunnel is in 54 feet and has cut a ledge from 8 inches to 2 feet wide which averages $55 per ton. No. 2 tunnel runs in on the lead 130 feet and the face is about 75 feet below the apex. The vein is from 18 inches to 3 feet wide. The plant is a 2-stamp mill, ore feeder and rock crusher, capacity six to eight tons per day, and a gravity tram connecting the ore bins at the mouth of the tunnel with the mill below. R. Hicks is foreman.

TUOLUMNE COUNTY.

In the Soulsby mine at Soulsbyville the vein has widened and is richer than ever, carrying, it is claimed, over $100 in free gold and $250 in sulphurets. Tbe vein averages 15 inches in widtb.

The Anderson mine tunnel at Carters is in about 200 feet. The hard rock has been gone through and 4 feet a day are being made.

The Wbeal Perrin mine at Soulsbyville has been unwatered and is to be prospected.

An addition of ten stamps to the Republican mill at Jacksonville has been decided upon and contracts for the machinery are to be let at once. The chlorination plant will not be added at present.

The New Era, formerly the Gold Hunter mine, 16 miles east of Sonora in Buchanan district, has been bonded. It lies across a deep canyon which cuts several veins that have been worked at intervals by tunnels and have produced well. C. A. Holland, the present manager, has sunk a shaft in the canyon, and stoping out ore has paid expenses and for a complete 10-stamp mill.

At the Bedrock Blue Gravel claims on Table mountain at Sonora, owned by C. L. Lang and associates, the old Virginia tunnel is now being cleaned out to the heading supposed to be in 800 feet. Then it is proposed to make the first upraise to the gravel channel.

The App Con. G. M. Co. has transferred all of its property in Tuolumne county, excepting the New Albany mine, to the Rawhide G. M. Co. for $14,975 of fully paid capital stock of the Rawhide Co. The mines in the transfer are the Rawhide and App mines and mill sites, the Heslep and Hitchcock quartz mines and the Martin, Nevills and Ballard placer mines, and other property near Jamestown. The Guild G. M. Co. has deeded to the Rawhide M. Co. all its property.

The Horseshoe Bend mines, near Melones, controlled by a Boston, Mass., company, have erected buildings and shops for operating on a large scale.

Four feet width of $30 ore is reported encountered in the Dollie Dimple mine on Yankee h ll, operated by H. C. Kennedy of San Francisco and E. J. Gilbert of Columbia, under bond from G. W. Mapes. They will drive a tunnel to develop the vein at a depth of 300 feet below the old workings.

The Bourbon mine on Knights creek, owned by Signoretti & Capelli, has been bonded by H. C. Dodds of Oakland, who will begin operations at once.

M. E. Sanford has deeded to the Horseshoe Bend G. M. Co. eleven quartz mining claims, water rights and three mill sites, situated on the Stanislaus river, about 4 miles west of Columbia.

YUBA COUNTY.

J. O'Brien has deeded to the United States land for constructing debris barriers in the Yuba river, reserving the right to mine, for $3000. It is understood that other payments have been made for land for the barriers.

COLORADO.

BOULDER COUNTY.

The court has ordered the sale of the chlorination mill at Eldora. This is with the consent of the parties interested. It is understood that it will result in starting the mill again.

The Lucky Star mine, at Ward, has shipped a car of its mill ore as a trial test to the new concentrator recently installed in the Culbertson mill. Should the test prove a success, plans for a tramway connecting the mine with the railroad will be

taken up to provide more economical transportation.

CLEAR CREEK COUNTY.

The Mondota mine, at Silver Plume, has 3 to 4 feet of ore in the shaft that mills 60% lead and thirty-five ounces silver. The concentration mill recently bought by J. W. Olds is being rearranged and fitted up under the management of W. P. Jewell.

The Waltham M. Co. of Idaho Springs, A. Anderson, president, and R. H. Hastie, manager, have taken a lease and bond on the Waltham property at Russell, and will open it up at once. The shaft is down 50 feet in the vein about 3 feet wide, which runs about $13 a ton. A power plant will be put in and a shaft house erected.

The Gold Standard mill on Chicago creek, near Idaho Springs, is putting in stamps to crush the ores from the Black Eagle mine, rolls having been found unsatisfactory. The ores are crushed, passed to concentrating tables and the slimes are carried to vats for cyaniding. The addition will make it possible to cyanide about twenty-five tons of tailings a day. The tables will catch 60% of the concentrates.

Examination of Empire's ores, it is stated, has determined their adaptability to profitable reduction by pyritic smelting. The immediate question is how to profitably treat the grade, containing from $5 to $10 in gold values—too low in grade to pay for smelting and transportation charges and too solid for wet concentration. Large bodies of this description have been developed at Empire. It is believed these low-grade ores can be made to pay, and a pyritic smelting plant is under consideration.

J. H. Robeson, manager of the Seven-Thirty, Bismarck, Dives-Pelican, Illinois, Burleigh and other properties at Silver Plume, has let a contract for about 1300 feet of drifting and an upraise of 250 feet to connect the shaft of the Seven-Thirty with the workings of the Burleigh. This contract when completed will unwater approximately 5 miles of underground workings and will also open a large area of unexplored territory.

B. J. O'Connell has located a tunnel site on Republican mountain at Georgetown, and contemplates driving entirely through the mountain. He has bonded the Gambetta mine, the only original location within the entire route of the tunnel.

CUSTER COUNTY.

The Bull Domingo mine, at Silver Cliff, is to be operated on an extensive scale, preliminary work having been begun. E. J. Christie of Marion, Iowa, is manager. The hoist has been removed from the Geyser mine to the Bull Domingo.

GILPIN COUNTY.

The Justice Leasing Co. of Denver will operate the Justice mine in Lower Lake district, with T. A. Irvine as manager. A contract has been let to sink the shaft a further depth of 75 feet.

A new 10 H. P. gasoline hoist is being installed at the Kate and Francis mine, owned by the Wilkesbarre G. M. & M. Co., E. C. Sherman Supt., at Eureka, and an addition is being made to the shaft building. The shaft bottom at a depth of 185 feet shows lead and copper ore.

The Penobscott M. & M. Co. of Pierce, S. D., has been incorporated, capital $1,000,000, to operate near Perigo, by L. L. Stephens, Pierce, S. D., P. J. Hamble and W. Bayler, Valley Falls, Kans.

The Omaha G. M. & M. Co. of Central City has been incorporated by J. N. Drake, J. A. Smith and J. Saling, capital $1,000,000.

G. K. Kimball and associates of Idaho Springs have organized the Russell Gulch M. & Dev. Co., to operate the Warfield group of four claims. A new plant has been installed, including a steam hoist, and a new shaft house, 20x50, is being built.

GRAND COUNTY.

Mining on Gold Run at Sulphur Springs is to be resumed by the Touraine G. M. Co. of Boston, Mass., Mr. Killduff, representing the company, being on the ground to start the work. On account of a deficiency of water in Gold Run creek in the fall, the company will build a reservoir.

GUNNISON COUNTY.

The Union Park Placer M. Co. has resumed work on its placers at Tin Cup. The flume and ditch will be finished in July, when washing will commence. R. W. Spensley of Leadville is Supt.

The Galveston Co., which has bought the Whig group of claims in the Gold Brick district, near Gunnison, has let a contract to sink a deep double compartment shaft. A first-class plant of machinery will be put on, and the operators say they may sink to a depth of 1500 feet.

The Grizzly M. Co. proposes extensive operations at Tin Cup this season. Its property is located on the north side of Taylor park and has a 200-foot tunnel. The company proposes to expend $25,000 in constructing a concentrating mill and in development.——The Kentucky Gulch M. Co. will operate on a large scale this year. The property is showing a vein of ore, carrying good values in gold, silver and copper. Machinery will probably be put on.——The Iowa M. Co., owning property in the same district, has equipped it with a fine plant of machinery and will oporate extensively.——The shaft on the Star mine is 190 feet in depth and has three levels extending from it, all of which are in ore, a high grade lead carbonate. It is believed that H. B. Gillaspie and his associates will operate the Star extensively this year.

At Elko the Galena Mountain M. Co., which erected a 50-ton concentrating mill last fall, will put it in operation to handle the low-grade ores.——The East Rock M. & M. Co., owning a group, will do considerable development work.——The Brooklyn M. Co. is driving a long tunnel on the Harper group with a good plant of machinery. The veins to be cut by this tunnel will be reached at a depth of 1000 feet or more.

HINSDALE COUNTY.

Munro Bros have sold the Gold Mine claim, in Burrows park, near Lake City, for $10,000. The Gold Mine is a new location, lying about half a mile from the Iney-Hollister, where bonanza ore was recently found.

LAKE COUNTY.

On Mt. Elbert, at the timber line, near Twin Lakes, a 2300-foot tunnel has been driven by the Twin Lakes G. M. Co., cutting a vein that carries from 200 to 300 ounces silver and from ½ to 4 ounces gold. New York people are interested and J. D. Bartlett is Supt.

The Fryer Hills Mines Co., capital $3,000,000, has been incorporated by Chicago, Ill., New York and Denver people, making a combination of the Union Leasing & M. Co. group and twenty mines with an area of 150 acres on Fryer hill, Leadville. Small companies have been unable to work this territory on account of the great water flow, and it has laid idle several years. Large pumping plants will be put in and the territory drained through the El Paso mine, which will be the base of operations. It will take four months to drain the mines.

LARIMER COUNTY.

In the Coldwater and Mount Zirkel properties, at Pearl, which are being developed under L. D. Godshall, Supt., at a depth of 45 feet the Coldwater shows a 6-foot vein of copper ore, 3 feet of which is solid copper glance, while the Mount Zirkel at a depth of 75 feet shows a 12-foot vein of sulphide ore. It is stated that the Coldwater and Mount Zirkel Companies will build a smelter and both properties will install steam hoisting plants.

SAN JUAN COUNTY.

The Royal M. & Investment Co. of Florence has bought the King group of mines at Silverton. M. H. Kinney is president; C. N. Kinney, secretary-treasurer, and W. R. Pyke, of Hooper, Supt.

E. Goodwin, H. Stroebel and Conyers Bros. have been opening their group of 16 claims, near Gladstone, through a tunnel to cut the Independence vein. A shaft sunk on the Independence vein shows $40 a ton ore, principally silver.

The Bear Mountain M. Co. is preparing to resume work on its group of 5 claims, near Silverton.

SAN MIGUEL COUNTY.

It is reported that the Four Metals Co. may build a mill this summer for the Palmyra mine. New ore bodies have been opened and the continuity of the high grade streak found in the lower level has been proven. An immense dump of milling ore awaits the erection of works for its reduction.

The Nellie mine at Telluride, owned by the North American Ex. Co. of New York, has been leased by it to J. Campbell of St. Louis, Mo., and E. I. Field and L. L. Nunn of Denver. The average value of the ore taken from the mine is $11 a ton. The lessees expect to keep thirty stamps going. E. I. Field is manager.

TELLER COUNTY.

Brewster & Bradley, lease operators of Cripple Creek, have taken a two-years' lease on the Pride of Cripple Creek mine and commenced prospecting. The ore assays $45 a ton and there is reported to be a fair sized body of it. The lessees will install a steam or electric hoist.

The Free Coinage Co., at Cripple Creek, is receiving between $2000 and $2500 in royalties each month from five sets of lessees, who are operating leases and making a production altogether of about 230 tons a month.

Daniel Maclaren, the Scotch mining engineer who has been making an examination of Stratton's Independence mine at Cripple Creek, has completed his examination and says that he has gone over all workings, and has been in every nook and corner, and "it is my opinion that the Independence mine has been underestimated. I am confident that there is over $2,000,000 worth of ore in sight—that is from the surface down to the ninth level. If the mine is carefully worked and the waste separated carefully, the profit would be greater and the average per ton would be greater than it is to-day. When the tenth and eleventh levels reach the volcanic complex, there will be as large bodies of ore found as there were in the upper levels."

The Addie C. claim on Mineral hill, at Cripple Creek, has been sold for $32,000 to J. C. Farrell and J. K. Walch.

The report of the Golden Cycle G. M. Co.'s production of the mine at Cripple Creek during the past three months shows that the mine earned $48,709 05. The tonnage in January was 3552, average value $13.48, total $47,906; in February it was 3342 tons, average value $10 99, total $36,743.86; and in March 3419 tons, average value $11.30, total $38,625. The report shows: Cash on hand Jan. 1, 1902, $7587 67; profits for January, 1902, $21,355.32; profits for February, 1902, $14,479.85; profits for March, 1902, $12,873.88; received from rent of hoist, $136; cash on hand April 1, 1902, $56,432 72. The March profits were cut down by extra outlays made in that month for sinking the shaft, $4000; machinery, $2000; insurance, $500; legal expense, $700—which amounts to $7200. The average cost for mining and milling a ton of ore is but $8, that of Stratton's Independence $16 a ton, and the Portland bas been $23. The conditions are not identical in the three properties.

The Vindicator Con. G. M. Co.'s report for the first three months of 1902, as made by Manager F. J. Campbell, shows that during January, February and March the mine produced 3586 tons, which yielded a gross value of $172,743. The treatment and transportation charges were $33.730, leaving net smelter returns of $139,013. The operating expenses were $78,859, which left net profits of $60,523.

W. C. Little, manager for Helton, Tahor & Burley, Michigan people, who are leasing on the Dexter claim at Cripple Creek, have made a strike in a crosscut from the main shaft at a depth of 150 feet. A small trial shipment has given returns of four ounces gold per ton.

Childers & McLeod, who have a lease on the dump of the Doctor-Jack Pot, have received returns on a small trial shipment at $21 to the ton, showing a saving of shipping values from the dump.

Stratton's Independence M. Co. of Cripple Creek has begun suit against the Strong M. Co., charging the latter company with extracting ores from the Maggie lode mining claim, which adjoins the Strong property, and asking damages to the amount of $1,750,000.

The Theresa M. Co., at Cripple Creek, has resumed work on company account and is working on the 500 and 600-foot levels. There is a probability of the shaft being deepened down to the 800-foot level. For the past few years the property has been in the hands of lessees and they have paid royalties enough in the treasury of the company to permit of work being resumed on company account. C. Emerson is manager.

IDAHO.

CUSTER COUNTY.

The White Knob Co., at Mackay, is putting in an electric line 12 miles in length to convey the ore from the mine to the smelter, which is being built of 600 tons daily capacity.

IDAHO COUNTY.

F. Brown, manager of the Jumbo mine, at Buffalo Hump, has ordered six stamps, to add to the four stamps already installed, and also expects to install a saw mill. The Jumbo, operating four stamps since Aug. 15 last, has been producing an average of $7100 per month.

The B. B., at Buffalo Hump, is operating ten stamps on ore taken from the 65 and 200-foot levels. It employs about thirty men in mining and development.

W. E. Pierce & Co. have arranged for putting in a saw mill at the town site of Caswell, at Thunder Mountain, with a capacity of 50,000 feet per day. The logs will be secured from the town site and the surrounding country. It is expected that this machinery will he started for Thunder Mountain about May 1 and to have the mill going before June 1.

William Beals, Jr., M. E., of Beals & Whittle of Boston, who examined the Dewey mine at Thunder Mountain, says the average value of the ore is less than $5 per ton at the mill, and there are neither veins nor lodes on Thunder Mountain. It is simply a placer deposit influenced by geyser action. There are two kinds of gold, placer and geyser, the former the more valuable, the latter carrying a considerable proportion of silver. Mr. Beals states that the idea of there being $125,000,000 in the Dewey mine or even a small fraction of that amount posed is a gross misrepresentation of actual facts.

LEMHI COUNTY.

Discoveries of coal in the Salmon Lemhi valleys during the past two months have shown three or four workable deposits of a good quality of lignite, clean and hard, and from 4 to 7 feet thick in the clear. The lignite belongs to the Miocene-Tertiary formation, and the field extends up the Lemhi river about as far as Junction, and as far up the Salmon as Cronk's canyon. In this area one workable bed has been found, which with few exceptions, wherever opened, shows from 4 to 7 feet thick.

Dalo Bros. have been operating the Italian mine, near Salmon City, and have in a 75-foot tunnel cut a new vein, showing 1 to 4 feet of pay rock. The mine comprises 6 claims and is equipped with a 10-stamp mill. A. Dalo is Supt.

WASHINGTON COUNTY.

W. B. Wright, Supt. of the Denver & Chicago M. Co., operating mines on Rapid river, north of Council, states that during the winter about 100,000 feet of lumber has been cut and that mining will commence in the spring. The company will build a 10-stamp mill on their property this season.

MONTANA.

FERGUS COUNTY.

The North Moccasin M. Co. has started work on the Santiago and the Santiago Fraction at Kendall, to ascertain the dimensions of the ore body, with the intention of erecting a mill in the near future.

The development work on the north end of the King-Barnes property is reported to show results better than anticipated. A 150 foot tunnel and a 50-foot crosscut both ways from its end are in high-grade cyanide ore. A mill is being considered for the mine.

FLATHEAD COUNTY.

The 10-stamp mill erected on the Blacktail G. M. & M. Co. property, near Libby, too late last season for operation during the winter, was damaged by a snowslide. Repairs are being made and a full force of men will start up work in the mines about May 1. A. J. Moore is Supt.

GALLATIN COUNTY.

M. L. Rickman and E. V. Blankenship of Bozeman, who have been developing a deposit of corundum on Camp creek, report that they have discovered another deposit of corundum. One of the veins is stated to be about 32 inches and the other about 3 feet wide. One of the veins carries ruby crystals scattered through feldspar and the other is of corundum proper.

LEWIS AND CLARKE COUNTY.

The shaft being sunk by Iowa people on the Farmer lode on Scratch Gravel, near Helena, is down 170 feet and is in 6 feet of solid ore from the grass roots down. The ore is free milling and will average between $10 to $15 in gold. Ten tons of the ore milled have yielded $9.50 a ton in free gold, no concentrates being saved.

The works of the American S. & R. Co. at Helena have been closed down because of a strike ordered by the Mill & Smelter Men's Union because the company will not recognize the union. It is stated that there is no question of wages, hours of labor or other grievance involved. Manager C. W. Whitley says that the works would be closed down indefinitely.

MADISON COUNTY.

Late accounts from Sand creek report a stampede to the new fields. The ground for a radius of 10 miles has been staked off.

Two carloads of machinery for the tramway of the Boss Tweed mill, at Pony, have been delivered. The company has made a shipment of 100 tons of ore hauled to Anaconda for treatment to determine the kind of concentrating machinery required for its reduction.

MEAGHER COUNTY.

It is reported that work will be resumed on the North Pacific and Darling fraction mines of the Daly group at Copperopolis by W. W. McDowell of Butte, operating under a bond.

SILVER BOW COUNTY.

In the Pacific mine, at Butte, crosscutting is in progress at the 200-foot level, and arrangements are being made for the necessary pumps and boiler capacity to sink deeper.

R. Bagley of Pittsburg, Pa., has bonded the Altoona and other claims in the East Butte district and proposes to develop them. A shaft on the Altoona is nearly 400 feet deep.

The Heinze copper properties at Butte have been taken over by the United Copper Co. of New York, capital $50,000,000, of which $5,000,000 is 6% preferred stock and the balance in common shares. The Heinze properties transferred include the Montana Ore Purchasing Co., Nipper

Con. Copper Co., the Cobra and Rock Island group, the Minnie Healey mine, the Belmont and a number of others.

NEVADA.

ESMERALDA COUNTY.

A report, stated to have been confirmed, says that a great gold strike has been made at Lone Mountain, 30 miles west of Tonopah. The ore body is 40 feet wide and is said to average $100 to the ton. The discovery was made by an Indian, who took white prospectors to the place.

LYON COUNTY.

J. E. Paramore, president of the Oakland Con. M. Co., operating at Como, says a 12-foot ledge has been lately struck, the concentrates from which assay $57.85 per ton. A new tunnel has been started.

NYE COUNTY.

At the Tonopah M. Co.'s mine at Tonopah the two-compartment permanent deep shaft on the Valley View is down 140 feet. When the 150-foot mark is reached crosscuts will be run and the sinking will continue. The Brougher shaft is down 300 feet, from which point there will be a crosscut run to connect with the Valley View shaft. East and west drifts are being driven on the veins from the 300 level, and the body of ore in the east drift on the 250 level is now being cut into on the 300. The ore body in the 250 level is at the present time 7 feet thick and averages $500 per ton.——The three-compartment shaft on the Mizpah ground is down 215 feet. The first station will be at the 300 level and a crosscut to the Brougher shaft will be started from it. The company has about 150 men employed and is increasing the number. The company is completing its assay office, a four-room building built of Nevada granite, walls 2½ feet thick, corrugated iron roof, redwood ceiling. The rooms will be used as assay office, assaying room, weighing room and draughting room. The office building will be a stone structure, 30x40, containing main office, mansger's office, superintendent's office, stenographer's room and a steel-lined vault. East of the main office building a short distance, will be erected the company's buildings, consisting of quarters for the officers, spare rooms for visitors, etc., also stables, blacksmith and machine shops. Store, compressor and ore houses are already completed.

Details concerning the strike on the Fraction claim at Tonopah by A. J. Crocker, one of the owners, describe the Tonopah Fraction M. Co.'s property as adjoining the main group of the Tonopah M. Co. on the west and in direct line with the ledges of the Valley View, Silver Top and Desert Queen claims. These ledges are lost to view on the surface where they enter the lines of the Fraction Co.'s claims, dipping under a capping of porphyry of a later flow than that containing the mineral. A shaft was sunk on the Fraction property through the capping, at a depth of 140 feet entering the ore-bearing porphyry, and crosscutting when at a depth of 240 feet, 5 feet of very rich ore was struck, assays of which run between $100 and $300 a ton. The ore is very hard and contains ruby silver and sulphides, resembling the Comstock bonanza ores.

The Ray M. Co. has been incorporated in Arizona, capital $500,000, with J. L. Butler president and J. R. Duffield secretary; principal place of business, Tonopah, with mines at Ray. The company's shaft is down 175 feet in a good body of shipping ore.

STOREY COUNTY.

The $2000 bond on the Lizard mine, below Sutro, has been taken up by the California company which has been operating the property for the past year and the money paid over to the former owners, G. Midgley, S. Morgan, P. Roberts and E. Tailleur of Virginia City.

WASHOE COUNTY.

J. Sparks expects to have his new mill ready for reducing the Reno Star ore at Wedekind by May 15th. The mill is of thirty tons capacity, which will be doubled if it works satisfactorily.

WHITE PINE COUNTY.

The Smoky claim, at Ely, owned by J. Ostegard and R. J. Harmon, has developed a good body of copper sulphides in the shaft. F. Paul, representing the Giroux Syndicate, has bought Mr. Harmon's half interest.

NEW MEXICO.

COLFAX COUNTY.

The Willow Creek Placer Co. of Las Vegas has been incorporated, capital $100,000, with H. G. Coors president, J. A. Carruth secretary and F. A. Edwards superintendent. The company will operate the Willow Creek placers, near Elizabethtown.

B. F. Groomer and W. J. Murray of Trinidad, Colo., and J. E. Lowrey of Sopris have bonded at $5000 the Free Gold claim of the Chickasaw M. & D. Co., situated between Red River City and Elizabethtown, in the Morino mining district. The ore on this claim is brown hematite, carrying gold.

GRANT COUNTY.

The Lena M. Co. at Lordsburg has received returns from the first three cars of concentrates turned out at the new concentrating plant recently built at their Shakespeare mines, the amount being between $7000 and $8000. The product was the result of reducing five tons to one.

Work on the new 60-ton smelter to be constructed in the Burro mountains will soon be commenced by Cross & Laughlin of St. Louis, Mo.

A diamond drill will be installed by the Rose Copper Co. on their property near Santa Rita.

An extension of lease for two years has been secured on the Arizona mine at Pinos Altos by W. McAllister, and a new double-compartment shaft will be sunk and a new hoisting outfit will be installed.

A proposition is under consideration to organize the Mine Owners' & Ore Shippers' Association, to include all the mines of Grant county, for the purpose of assisting the miners in disposing of their product at the highest market price. A sampling works to be controlled by the ore-selling committee would be part of the scheme.

The Wilson M. Co. at Stein's Pass has bought the boiler and machinery formerly used in the Lone Mountain mill, and has had it installed in their own mill.

The Michigan-New Mexico C. Co., operating at Shakespeare, has arranged with the American Con. C. Co. to take its ore. The latter company has plans perfected for the erection of a plant of capacity to handle the output of both mines. Besides copper values, the ores carry gold and silver.

SOCORRO COUNTY.

In April, 1901, D. M. Estey, with workmen, tools, lumber, tents and provisions, started work at the town and mill site of Estey City. At this time, a year later, the reduction works, boiler and engine rooms, ore bins, two story store and office building, boarding house and bunk houses, blacksmith shop, laboratory, magazine, stables, carpenter shop and dwellings for employes and their families are complete. The reduction works have a capacity of 300 tons of ore per day. One-half of the reduction mill construction is of stone. The boiler house, engine room, laboratory and powder magazines are entirely of stone, and the foundations of all the other buildings are of the same material. The engine room and the main mill are separated by a massive stone fire wall. It requires 300 H. P. to drive the reduction and electric machinery. All the motive power, electric lighting and other machinery is installed.

OREGON.

BAKER COUNTY.

The E. & E. mine at Sumpter, once bonded to J. Bourne, C. W. Knowles and H. Knowles for $24,000, and rebonded for $1,000,000 to St. Louis people, who erected a 20-stamp mill, but only run a short time, is reported sold. Later J. H. Longmead of Montana secured a four-year lease, during which time he took out over $900,000 net, but was unable to secure an extension of his lease. There has been some 7000 feet of work done on the vein and a vertical depth of 200 feet gained, but the old works, it is stated, will have to be abandoned and a new shaft started.

JOSEPHINE COUNTY.

The St. Helens & Galice M. Co. of Portland, with A. B. Cousins as secretary, which owns the Cousins & Adkinson mines at Galice, are negotiating to buy all the placer properties along Galice. The new company proposes to combine the several mines along the creek and work them as a single property and on a large scale by erecting a large double flume in the bed of the creek.

In the Copper Stain mine, near Leland, it is stated by Supt. Dana that the ledge, where it is tapped with the long tunnel, about 300 feet down, is larger and richer than ever. The company will build 6 or 7 miles of wagon road to get the necessary machinery to the mine.

J. C. Lewis' upper mine, near Leland, is being worked night and day with a full force of men. There is 240 feet pressure at the hydraulic giant and a 100-foot bank of gravel, at the bottom of which is a heavy blue gravel lead. The bank carries coarse gold from the surface to the bedrock.

LANE COUNTY.

Contracts for construction of the Oregon & Southeastern Railroad, to be built between Cottage Grove and the Bohemia mines, have been signed, and the road is to be built this year to the border of the Cascade forest reserve, a distance of 21 miles from Cottage Grove. The work will begin as soon as the workmen can be secured. It is said, too, that the same people that have brought about the exploitation of the Bohemia mines and secured the railroad have arranged for the construction of a large smelter in Portland to treat the ores.

UTAH.

BOX ELDER COUNTY.

At the Tyche property in Park Valley, owned by P. A. Sorensen, S. P. Armstrong and others of Salt Lake City, a shaft is down 50 feet in a wide vein that shows gold values believed to average $18 to the ton. The erection of a 16-stamp mill is under consideration.

IRON COUNTY.

W. J. Halloran and F. M. Wilson of Salt Lake City, owners in the Johnny mine at Stateline, state that twenty men are blocking out ore. A drift has been run on the 100-foot level 140 feet through ore without a break. The property is equipped with a hoisting plant, and preparations are being made for the erection of a 16-stamp mill, which will be begun at once.

JUAB COUNTY.

The Melville M. & M. Co. has been incorporated at Salt Lake City, capital $30,000, with P. J. Quealy, president, and H. C. Lund, secretary. The company owns the Copper King, Copper Queen and a number of other claims in the Moss district.

SALT LAKE COUNTY.

Since Dec. 1, 1901, 600 feet of development work has been done on the mine of the Columbia Copper M. Co. at Bingham, including in this the driving of the new tunnel 375 feet. The tunnel will in a short advance cut the What Cheer ledge. A large amount of work is laid out, and it is the intention to add 3000 feet to present developments before finally considering the proposition to build a mill.

SUMMIT COUNTY.

The Lake Flat M. Co. of Park City has been incorporated, capital $38,500, to operate the Lake Flat and Jordan claims at Park City. H. Shields is president and J. P. Burns, secretary.

The Weber & Kearns concentrator, bought at Park City by the D. & M. Co., is to be moved to its mine immediately. It is understood there is ore on hand to keep the concentrator operating for some time. Samples tested have returned assays of 50% lead, 40 ounces silver and $10 70 in gold to the ton. The vein is from 1 to 2 feet thick.

The Park Gold King M. Co., owning 15 claims in Thayne's and Iron canyons, near Park City, has started work. The incorporators are G. Lindsay, Jr., H. R. Lindwall, F. C. Thompson, W. Y. Mosher, Rosa H. Lindsay, C. F. Thompson and M. Sommer of Park City.

TOOELE COUNTY.

The Black Diamond mine at Stockton is reported sold by E. P. Mitchener & Co. for $25,000. It is stated that the buyers will begin at once the development of the property and that the installation of a concentrator is quite probable.

The Ophir Queen M. Co. has been incorporated at Salt Lake City, capital $250,000, with B. T. Cannon, president, and J. B. Weimer, secretary and treasurer. The company owns the Ophir Queen group at Ophir.

Manager G. Moore of the Sunshine gold mine at Mercur reports 100 tons of ore going through the new mill that averages about $5 per ton, of which over 90% is being recovered at a profit. He says that $3.50 ore can be worked at a profit in the new mill, and expects to make $1 50 ore pay. The novel operation of the filter presses is making the present work slow; but as the men become acquainted with the work, the tonnage is expected to gradually increase.

The Calumet mine, at Stockton, is reported sold by Nuson & Niedringhaus of St. Louis, Mo., to New York people. The group consists of twenty-five or thirty claims, from which nearly $200,000 was taken from an ore shoot above water level. The reopening involves, it is stated, the control of a large flow of water by pumps.

WASHINGTON.

FERRY COUNTY.

Three cars of ore shipped from the California mine at Ophir to the Grand Forks smelter have netted $10,000.

At the Tom Thumb mine, at Republic, in March, 90 feet depth was gained in the 400-foot working shaft at a cost of $33 per foot. The shaft has just been completed to the 400-foot level and a station cut.

STEVENS COUNTY.

The Waukegan - Washington M. Co., operating near Bossburg, is planning extensive improvements and has bought a $10,000 machinery plant including Corliss engines and a ten-drill compressor plant, which will be installed at once. A concentrator is being secured to reduce the bulk of the gold-copper ore before shipment.

WYOMING.

CARBON COUNTY.

The New Rambler copper mine, near Grand Encampment, is to have its own smelter. The erection of the building will soon be commenced and it is expected that within two months the smelter will be in operation.

FOREIGN.

BRITISH COLUMBIA.

The Mines Exchange, Ltd., of Nelson, reports that the Mollie Gibson mine, in the Slocan, has shipped 1000 tons and the Rambler-Cariboo 1260 tons since Jan. 1. The latter property steadily employs 100 men.——The Byron N. White Co. of Sandon has made application for 1000 inches of water near New Denver and has already began the preliminary work of installing a power plant to supply the mines and towns in the Slocan with power and light. According to the plans, the water will be delivered at the plant under 350-foot head. ——At the Silversmith, one of the claims of the Byron N. White Co., the latest report is that there is exposed in the drift face 4½ feet of steel galena, running 500 ounces silver and 70% lead, with a high-grade concentrating ore of considerable thickness between this body and either wall of the vein. Five cars of high-grade ore have been shipped, taken out in development work only.——The Sunset mine, at Cody, paid its regular monthly dividend of $6000 on April 17. The Sunset is an individual enterprise and is worked on a very small scale. A specimen of solid galena, weighing 125 pounds and containing 185 ounces silver and 82% lead, was recently taken from the vein on this property.

The Anglo-Slocan Syndicate, with a capital of £5000 in £1 shares, with registered office in London, Eng., has been incorporated to operate the Wakefield mine.

M. Gilliam, foreman of the Bayonne group at Nelson, reports that the tunnel has been driven 260 feet, showing the vein to be 30 feet in width of ore of fair milling grade.

The Ollala Copper M. & S. Co., capital $8,000,000, is developing its holdings in the Similkameen valley, consisting in part of sixty mineral claims, the town site of Ollala, together with a charter for the Similkameen & Keremeos Railroad and telegraph and telephone franchises.

The Black Warrior group of claims near Trout lake has been bonded by B. Coursier of Revelstoke to W. B. Webber of Winona, Minn., at $37,500, until Nov. 1, 1903

Nelson, April 23.

A strike is reported made on the Hideway group at Salmo of a vein of free-milling ore 10 feet wide, sampling an average of $61 per ton. The owners, McArthur, Waldbeser & Broadfoot, are preparing to ship to the Nelson smelter.

The discovery of gold in a beach deposit of black sand is reported at Cape Scott at the northwest end of Vancouver island.

The use of electricity from water power as power for dredgers on the Fraser river is projected. Mr. Amos, representing Pittsburg, Pa., people, is superintending the construction of a dredger at Cayoose creek which is to be operated by electricity. It is proposed to dam the creek and secure water power to operate dredgers between that point and Lytton, a distance of 30 miles.

MEXICO.

At Minas Prietas, Sonora, the Creston-Colorada M. Co. are rebuilding the machine shops destroyed by fire in March. A plant of the latest improved machinery, including heavy lathes, drill presses, etc., will be installed.

A. McNeil of New York has bought the Dewey mine, near Willard station, between Hermosillo and Torres, Sonora, and is making preparations for development on an extensive scale. C. L. Fisher is Supt.

The new owners of the Carrera mines, near Minaca, Chihuahua, propose to erect near that town a 200-ton concentrating plant. The ore runs high in zinc and lead.

J. R. Hooper, Z. O. Stocker and R. McCalmont are doing development work on the Guijosa Grande group of five claims, including some forty pertenencias, near Arevechi, Sonora. A ledge of high-grade petanke ores, running from 400 to 600 ounces silver per ton, is being opened.

YUKON TERRITORY.

The Dominion Government has abolished the royalty on gold mined in the Yukon district and has made an export tax of 2½%.

"Arkansaw Jim" Hall has sold his famous No. 17 El Dorado claim to C. Helnhurger for $25,000, the sale to take effect after the present clean-up. It is estimated that Hall has at least $150,000 in the present dumps to wash up.

Personal.

G. H. ROBINSON of Butte, Mont., is in Salt Lake City, Utah.

R. GUENTHER of Salt Lake City, Utah, is in Los Angeles, Cal.

D. M. MAUNA is Supt. Mauna Bros. mine near Jesus Maria, Cal.

H. FRANKLIN has resigned as Supt. of the smelter at Deadwood, S. D.

G. MCDONALD has been appointed foreman at the Bouden mine, Gold Hill, Or.

W. W. GODSMARK is Supt. of the Ratcliffe mine at Ballaret, Inyo county, Cal.

E. I. FIELD, manager Nellie mine, Telluride, Colo., has returned from New York.

W. H. MERCER, Supt. Mercer Tunnel, near Globe, Ariz., has returned from New York.

G. H. LEIGHTON of Denver, Colo., was at Stockton, Utah, last week examining mines.

A. BUCKBEE, manager Con. Virtue mine, Baker City, Or., is in Salt Lake City, Utah.

M. MCLEISH of Denver, Colo., is examining a mining proposition near El Dorado, Cal.

C. L. FISHER has been appointed Supt. of the Dewey mine near Hermosillo, Sonora, Mexico.

W. E. SHEPMAN, manager of the Maple Creek M. Co. at Junction City, Cal., is in San Francisco.

H. A. COHEN, general manager DeLamar properties in California, Utah and Nevada, is in New York.

F. STEWART of Stockton, Cal., has been appointed Supt. of the Sugar Pine mine near San Andreas, Cal.

M. MCLEAN, Supt. of mines of the Detroit Copper Co. at Morenci, Ariz., has returned from California.

T. MENNIE, late mill Supt. Rock Lake M. Co. at the Bruce mines, Ontario, has returned to Butte, Mont.

L. S. BUTLER of Vera Cruz, Mexico, consulting engineer Summit Placer M. Co., is in Salt Lake City, Utah.

R. WILLIAMS has resigned as Supt. Anchor mine, Park City, Utah, and will shortly go to England for a visit.

T. D. HARRIS of Breckenridge, Colo., has been appointed Supt. of the Oro Grande P. M. Co. at Dillon, Colo.

H. E. T. HAULTIM, consulting engineer to the Hastings Exploration Co. at Nelson, B. C., has resigned his position.

W. R. ARTHUR has been appointed Supt. of the Placer county division of the South Yuba W. & M. Co. at Auburn, Cal.

BERTRAM HUNT has returned to San Francisco from San Diego Co., Cal., where he has been engaged in projecting a cyanide plant.

J. E. BOWERS of La Colorada, Sonora, has been appointed foreman for the American-Mexican Anthracite M. Co. at San Marcial, Sonora, Mexico.

M. M. DYER of Boston, Mass., has been appointed manager of the American Dredging Co. operating the Swan placer mine at Breckenridge, Colo.

FRANK MONAGHAN of Needles, Cal., has been appointed a member of the board of trustees of the State Mining Bureau, vice W. S. Keyes, resigned.

R. K. COLCORD, Supt. U. S. Assay office at Carson, Nev., has been appointed Supt. Con. Esmeralda Mines Co., which is starting operations near Hawthorne, Nev.

A. J. MOORE, formerly Supt. Michigan & Montana C. M. & S. Co. at Butte, Mont., has been appointed Supt. Blacktail G. M. & M. Co. at Fisher creek, near Libby, Mont.

W. B. WASHINGTON of La Colorada, Sonora, Mexico, is at Santa Rosa, San Salvador, engaged in the construction of a cyanide plant for the Minas Pretas syndicate.

JOHN W. DUDLEY of Washington, D. C., and P. M. Mullan of Nebraska have been appointed, respectively, register and receiver of the U. S. Land Office at Juneau, Alaska.

GEO. W. STARR, Supt. of the Empire mine at Grass Valley, Cal., has received the additional appointment of general manager of the North Bloomfield M. Co. at North Bloomfield, Cal.

Books Received.

"Report on Forest Reserves and Adjacent Timber Regions for 1899," by Henry Garnett, has been issued as Part V of the XXI annual report of the U. S. Geological Survey. Royal, 8mo, 711 pages, 143 plates and maps. The report includes reports on the Olympic mountains in Washington, Cascade Range in Oregon and Washington, Stanislaus and Lake Tahoe timber reserves in California, Lewis & Clarke reserve in Montana, and others. The volume can be obtained by application to the Director, U. S. Geological Survey, Washington, D. C.

Catalogues Received.

The Link-Belt Machinery Co. of Chicago, Ill., have issued catalogue No. 30 on "Modern Methods, Gold Dredging and Placer Mining Machinery." By engineers and operators of placer mines the catalogue will be found useful for reference and as a source of suggestion for operative practice, besides presenting clearly the special machinery made by the manufacturers. The Link-Belt Machinery Co., on application to their office, Twenty-ninth St. and Stewart Ave., Chicago, Ill., will mail the catalogue.

The Tracy Engineering Co. has issued a catalogue descriptive of, and illustrating the Fred G. King pocket reconnaissance instrument, a new surveying instrument, particularly designed for the use of miners and prospectors, and for surveyors needing for rapid reconnaissance work a single instrument adaptable to all the varied conditions and requirements of such work. The Tracy Engineering Co. will be pleased to mail the catalogue to those interested on application to its office at 151 Fremont St., San Francisco, Cal.

Standard Diamond Drill Co. of Chicago, Ill., has issued a catalogue on its diamond prospecting core drills. The company continues the manufacture of the Bullock diamond drills with the improvements that have been developed from experience with their use. The catalogue, as well as being descriptive of the machinery, is an up-to-date text book on diamond drill prospecting, which is coming more and more into every-day use about mines. The Standard Diamond Drill Co. will be pleased to mail their catalogue on application being made to its office at Chicago, Ill.

Pawling & Harnischfeger of Milwaukee, Wis., have issued Bulletin No. 7, a catalogue on the traveling electric hoists manufactured by them. The feature of these machines, of which the catalogue is particularly descriptive, is they have self-contained the full hoisting capacity as well as the full traveling power. Another novelty to many will be the type of the machine itself, which reverses the system of moving bodies about shops and yards, using overhead runways instead of floor trackage. The catalogue will be mailed on application to the Pawling & Harnischfeger Co. at Milwaukee, Wis.

The Trenton Iron Co., of Trenton, N. J., has issued its 1902 catalogue on the application of wire rope to haulage, shafts and inclined planes. It is illustrated with cuts of several types of engines and hoisting drums, and diagrams showing the details of application and subsidiary devices as modified by the varying conditions presented by practical mining. The sixty-four pages of this handy little catalogue contain a great deal of suggestive information on mine transportation, for mine managers and superintendents, and it will be found a useful addition to their pocket libraries of reference books. It can be had on application to the Trenton Iron Co., at Trenton, N. J.

Commercial Paragraphs.

F. M. DRESCHER and G. H. MacGregor, mining engineers and assayers, have located at Central City, Colo., buying out the business of the Cyclops Assay Office at that place.

THE Denver Engineering Works Co. reports a growing demand for electric hoists to displace steam hoists in the Utah and Colorado coal fields. It has recently shipped two 135 H. P. single-drum electric hoists, equipped with railway motors and controllers for a 500-volt circuit, to Castle Gate, Utah, for the Utah Fuel Co., which now has in successful operation a number of electric hoists built by this company, one of which, of the double-drum type, 135 H. P. capacity, is operating on an incline, hauling cars at a high rate of speed for a distance of over a mile.

THE Crocker-Wheeler Co. of Ampere, N. J., reports a large increase in the demand for its Crane motors and equipments of from 1 to 60 H. P. and in the various types designed to fulfill the several applications of cranes to trolley, bridge and hoist work. In motors the following are recent shipments on orders received in the past few weeks: Four motors, size 45, 50 H. P. output; eleven motors, size 22, 30 H. P. output; twenty-five motors, size 14, 15 H. P. output; four motors, size 6, 10 H. P. output; eleven motors, size 6, 7½ H. P. output; fourteen motors, size 2½, 2½ H. P. output.

THE Westinghouse Electric & Mfg. Co. of Pittsburg, Pa., reports the sale of two rotary converters of 300 K. W. each to the Manchester, N. H., Traction, Light & Power Co., to be located at Hooksett, N. H. They will deliver power for the operation of the Concord & Manchester branch of the Boston & Maine Railroad. The machines are to be supplied with a three-phase alternating current and will deliver direct current at 600 volts. Also, the sale of two rotary converters to the South Covington & Cincinnati Street Railway Co., Cincinnati, O., one being of 200 K. W. capacity and the other of 400 K. W. capacity.

Latest Market Reports.

SAN FRANCISCO, April 30, 1902.

METALS.

SILVER.—Per oz., Troy: London, 23½d (standard ounce, 925 fine); New York, bar silver, 51c, refined (1000 fine); San Francisco, 51c; Mexican dollars, 44½c San Francisco, 41c New York.

COPPER.—New York: Standard, $11.00@11.15; Lake, 1 to 3 casks, $12.00; carload lots, $11.75; Electrolytic, 1 to 3 casks, $12.00; carload lots, $11.62½; Casting, 1 to 3 casks, $12.62½; carload lots, $11.37½. San Francisco: $14.00. Mill copper plates, $17.00; bars, 18@24c. London: £52 5s per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; plg, $4.75. London, £11 15s per ton.

SPELTER.—New York, $4.42½; St. Louis, $4.00; London, £18 2s 6d per ton; San Francisco, ton lots, 5½c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, $28.25; San Francisco, ton lots, 30c; 1000 lbs., 30½c; 500 lbs., 30¼c; 200 lbs., 30½c; less, 31c; bar tin, ℔ lb, 35c.

PLATINUM.—San Francisco, crude, $17 ℔ oz.; New York, $18 per Troy oz

QUICKSILVER.—New York, $50.00 large lots; London, £8 15s; San Francisco, local, $47.50 ℔ flask of 76½ lbs.; Denver, $51.00. Export, $45.00.

BABBITT METAL.—San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER.—Half-and-half, 100-lb. lots, 19.30c; San Francisco, Plumbers', 100-lb. lots, 16c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $17.25; gray forge, $17.75; San Francisco, bar, 2.75 ℔ lb.,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $31.75; open hearth billets, $32.25; San Francisco, bar, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per bbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19 50; extra sizes higher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19 00; shingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. h. San Francisco: No. 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL.—San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11 75, long ton.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2½@3c ℔ lb.; blue vitriol, 5½@6½c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2½@2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 76c; cs., 81c; raw, bbl., 74c; cs., 79c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 66c; cs, 71c; raw, bbl., 64c; cs, 69c. Kerosene—Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13½c; Mineral Seal, iron bbls, 19c; wooden bbls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 15½c; do., cs., 21½c; 86° Gasoline, bulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 20½c; Lard Oil, No. 1 bbl., 60c: cs., 65c; Neatsfoot Oil, bbl., 70c; cs., 72½c; No. 1 bbl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¾c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb, 7¼c; less than 500 lbs., per lb., 7½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¾c; do. in kegs, 7¼c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c.

ASSAY LITHARGE.—Per lb., 9c.

BISMUTH.—Subnitrate, per lb., $1.60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c; calcined, 20c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2¼ lbs.

PHOSPHORUS.—(American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING APRIL 22, 1902.

698,386.—TELEPHONE SYSTEM—A. K. Andriano, S. F.

698,188.—WINDOW SASH—P. Barnum, S. F.

698,244.—COMPENSATING MOTORS—F. G. Baum, Stanford University, Cal.

698,245.—COMPENSATING MOTORS—F. G. Baum, Stanford University, Cal.

698,359.—PULLEY HANGER—J. W. Berry, Tacoma, Wash.

698,250.—RAIL BOND—G. B. Blanchard, Tacoma, Wash.

698,251.—RAIL BOND—G. B. Blanchard, Tacoma, Wash.

698,361.—OIL BURNER—W. Booth, S. F.

698,253.—MOVING BOULDERS—P. Bowery, Weaverville, Cal.

698,105.—GOLD SAVING DEVICE—L. D. Craig, S. F.

698,378.—STAMP STEM GUIDE—D. C. Demarest, Angels Camp, Cal.

698,278.—LAMP HANGER—H. J. Harrison, Juneau, Alaska.

698,016.—CYANIDE TANK—J. J. Hervey, Randsburg, Cal.

698,280.—MATRIX BAND RETAINER—A. J. Hiniker, S. F.

698,288.—WRENCH—L. W. Johnson, Jerome, Ariz.

698,312.—STOVE FIRE BOX—J. P. Neeley, Centralia, Wash.

698,134.—DRYING LUMBER—H. B. Phillips, Berkeley, Cal.

698,052.—DOOR GUIDE—W. N. G. Place, Seattle, Wash.

698,142.—BUTTONHOLE CUTTER—C. L. Rogers, Seattle, Wash.

698,227.—SHELF HOOK—C. A. Schrader, San Diego, Cal.

698,067.—BASKET PACKER—F. H. Smith, Wrights, Cal.

698,081.—PLOW—W. Turner, Paso Robles, Cal.

Recently Declared Mining Dividends.

	Payable.
Boston & Montana Con. C. & S. M. Co., quarterly $2 per share	April 17

SITUATIONS WANTED.

POSITION WANTED BY YOUNG ASSAYER. Understands analysis and working tests of ores. Address H. W., care this office.

SKILLED MILLMAN, ASSAYER, etc., wants work. Experience gained in camps of five States. Reference letters on addressing "1902," this office.

Thoroughly experienced and reliable Chemist, Assayer and Millman open for engagement. Ten years' Western States, Canada and Central American experience. Address "Oriand," care of Mining and Scientific Press.

CHEMIST AND ASSAYER, with experience in mining, at present employed with large copper and lead smelting company in Mexico, seeks position as chief chemist or assistant superintendent. Has practical furnace work experience Address "Furnace," care of Mining and Scientific Press.

WANTED.—By a young School of Mines graduate, a position with reliable mining company as assayer, chemist and surveyor. Considerable surveying practice, besides one season with U. S. Geo. survey. Can handle both and more, if necessary, for small company. State salary Have had practical mining experience. Good references. Address "Worker," care of this office.

WANTED.—Position by an experienced and reliable assayer of all metals, and Bookkeeper. Has also had five years' experience in general merchandise business. Will give references from one of the best gold-producing quartz mines in California. Wire or write E. C. M. W., care of Mining and Scientific Press.

MINING ENGINEER, practical miner and mill man, assayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best references. Now working in southern California. Address A. M. P., care of Mining and Scientific Press.

WANTED.—SITUATION AFTER MARCH 15, 1902, as Manager or Superintendent of mine. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work Four years' experience as manager and superintendent. Treatment of low grade ores a specialty. Practical in every detail. State location of mine and salary. Best of references. Address X. Y. Z., this office

WANTED.

WANTED.—A PRACTICAL CONCENTRATOR man, one who has had considerable experience with bornites and copper glance ores. State references and salary. Address "ETHEL" Copper Mining Co., Index, Wash.

WANTED TO BUY:

Interest in or all of a going Sampling Works, Ore Business, or Smelting Works. Address with particulars, L. X. D., Mining and Scientific Press, 330 Market St., San Francisco, Cal.

WANTED, for a developed mine in California, a competent mining engineer to look after development and exploration. Must be a full graduate of a recognized mining college and have had several years' practical experience in large iron, coal or copper mines, and be fully skilled in the engineering problems pertaining to extraction, haulage, ventilation, etc. Give full particulars of career, experience, age, etc., to "Vulcan," care of this paper.

WANTED.—A FIRST-CLASS MILL FOREman for 30-stamp mill with concentrators and cyanide tailing plant. Middle-aged or young man of education and extensive experience in above line preferred; must be thoroughly sober and furnish good references as to experience and character, give comp ete information as to experience, age, salary wanted, etc Address "Mill Foreman," care of Mining and Scientific Press.

WANTED.

Consulting Mining Engineer,

familiar with making examinations of mines, prospects and mineral lands. Address stating experience and references. Moderate salary to start, with advancement to competent man. Position permanent if found satisfactory. Address A., care of Mining and Scientific Press.

STAMP MILL WANTED,

either ten or twenty stamps, second hand, as near Amador County, California, as possible. Must be in good condition, and low as to price—advertiser has himself built mills and then tried to sell, so don't quote fancy figures Water-power mill preferred; steam no objection, however. Give full details, price, location, condition. Concentrators acceptable if with plant. Will also buy small hoist and any good second hand mine equipment. Address E. N. DARLING, 9 Pine St., New York.

WANT TO INTEREST PARTIES

in group of mines (70 acres) working under bond and lease, profitably shipping 160 tons per month of lead ores. Have developed large reserves of excellent carbonate and sulphide ores of the best of concentrating material Mill and lead smelter near mine. Will stand a rigid examination.

Address DAN C. TOBIN,
White Pine, Gunnison Co., Colo

Wanted, Capital

to develop a group of mining claims recently discovered in northern California Six lode locations from 10 to 30 feet in width, carrying gold, silver and copper.

For further particulars, apply to

AUGUST QUITZOW,
CRESCENT CITY, CAL.

FOR SALE.

FOR SALE.—Controlling interest in an option on 1700 acres of ground, patented, carrying large bodies of gold, silver and copper ores, with ample wood and water, in Sonora, Mexico Money to be used to secure title, develop, and erect plant. For coin guaranteed report, address Lock Box 35, Redwood, Cal.

QUARTZ AND PLACER PROPERTIES in Siskiyou Co., Cal., for Sale.

Collections attended to. B. K. COLLIER, Attorney-at-Law, Etna Mills, Cal.

The Mines Exchange, Ltd.

Mines and prospects in British Columbia, the Western States, and Mexico, for sale.
Free milling gold properties a specialty.
Write us for reports and information.
Bank references given.
Address THE MINES EXCHANGE, LTD.,
P. O. Box 700, Nelson, B. C.
Branch Office: P. O. Box 594, Salmon City, Idaho.

158 42/100 Acres of Dredging Property for Sale.

Best location for dredger. Two power lines within ¼ mile. Blueprints furnished to reliable parties, so no agents need apply. Nearest working dredge 1 mile. One building within ¼ mile.

For particulars, address J. H. G. H., Charden, Butte Co., Cal.

FOR SALE.

Gold Mine near Jamestown, Tuolumne Co., Cal., developed and ready for a mill; ore milled $20 per ton; price, $10,000 on hand. Also eight patented Mother Lode claims, all connected and well located, for $75,000. Call or write.

MINING BUREAU & REAL ESTATE CO.,
189-190 Crocker Building, San Francisco.

FOR SALE.

Three patented and joining placer claims with seven (7000) thousand tons or more of tailings, having an average assay value of five ($5.00) dollars per ton in gold.

Price, five thousand ($5,000.00) dollars.

For particulars, address

JOHN P. SCHMIT,
Helena, Montana.

FOR SALE.

On White's Gulch, Liberty Mining District, Salmon River Country. P. O. Sawyers Bar, Box 93, Siskiyou Co., Cal.

Group of mines, 7 in all. Large low-grade proposition. Gold and sulphurets—a No. 1 free-milling proposition. To be worked on large scale Thousands of tons of $5 and $6 ore in sight. Developed for over 3000 feet by tunnels and cuts. Timber and water. Close to wagon road, and out of deep snow.

Cash sale, or bond and lease with amount down on stated sum per month. Address owner,
HENRY H. MERRIAM.

Gold Mine for Sale,

Three Miles from Sierra City, Cal.

20-Stamp Mill complete; two Hoisting Works, with ore and water skips; wire rope, with 1500 feet of No. 12 sheet iron pipe, 18 in. diameter, connected to mill and hoisting works; blacksmith shop; boarding house; miners' cabins. For information and price, apply to

KNIGHT & CO.,
SUTTER CREEK, CAL.

Lallie's U. S. Standard narrow steel tapes with Patented SELF-ACTING METAL Reels, for long lengths, are the favorites with the Civil and Mining Engineers throughout the Rocky Mountain region. Catalog and prices upon application. Lallie Instrument Co., 1622 Arapahoe St., Denver, Colo.

Molybdenum Ores.

PACIFIC MOLYBDENITE MINING & REDUCTION CO.
594 Parrott Bldg., San Francisco, Cal.
BUYERS OF HIGH-GRADE ORES, CONCENTRATES OR INGOTS.

BEGEER'S
IMPROVEMENT OF
Cyanide Process.

Insures highest and quickest possible extraction. Does not increase working cost; can be attached to any cyanide plant at small expense. Does not present any mechanical difficulties and does not foul solutions. Has doubled leaching capacity in practical mill operation and thereby greatly reduced working expenses.

Write for particulars to

G. E. ALEXANDER,
McPhee Building,
DENVER, COLO.

ASSESSMENT NOTICES.

SILVER KING MINING COMPANY.—Location of principal place of business, San Francisco. California; location of works, Pioneer Mining District, Pinal County, Arizona Territory.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 17th day of April, 1902, an assessment (No. 24) of one ($1) dollar per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, 310 Pine street, Room 36, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 27th day of May, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on TUESDAY, the 24th day of June, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors
J. W. PEW, Secretary.
Office—310 Pine street, Room 36, San Francisco, California.

VIRGINIA CONSOLIDATED MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Inyo County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 2nd day of April, 1902, an assessment (No. 12) of two cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, No. 147 Larkin street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 5th day of May, 1902, will be delinquent and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 26th day of May, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.
B. A. BENARD, Secretary.
Office—147 Larkin street, San Francisco, California.

MARINA MARSICANO GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Sunny Hill, Shasta County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 21st day of April, 1902, an assessment (No. 29) of seven (7) cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, 217 Sacramento street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 20th day of June, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on FRIDAY, the 18th day of July, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.
CHAS. BOVONE, Secretary.
Office—217 Sacramento street, San Francisco, California.

DELINQUENT SALE NOTICE.

LARKIN MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, near Placerville, El Dorado County, Cal if rnia.

Notice.—There are delinquent upon the following described stock on account of assessment (No. 12) levied on the 5th day of March, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
W. E. Lutz	10	100	2 00
J. B. Quigley	291	250	5 00
J. B. Quigley	314	500	10 00
J. B Quigley, Trustee	316	500	10 00
Dr. Owen Buck and	324	200	4 00
Dr. Owen Buckland	325	200	4 00
Dr. Owen Buckland	326	100	2 00
W J Likens	336	200	4 00
Chas. Downing	344	1,334	26 68
H. M. Holbrook	362	1,000	20 00
Dr. Owen Buckland	369	500	10 00
J. B Quigley	375	250	5 00
W. O. Johnson	397	75	1 50
Ella Kirkham	404	200	4 00
W. T Lally	414	300	6 00
W. T. Lally	415	200	4 00

And in accordance with law, and an order of the Board of Directors, made on the 5th day of March, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, 112 Main street, San Francisco, California, on MONDAY, the 5th day of May, 1902, at the hour of 2 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of sale.

N. F. REMINGTON, Secretary.
Office—112 Main street, San Francisco, California.

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Notice of Removal of Principal Place of Business of Corporation.

WHEREAS, at a special meeting duly called and noticed, of the Directors of the HASKELL GOLD MINING COMPANY, held at the office of Company in San Francisco, the 24th day of April, 1902, a resolution was duly adopted that the principal place of business of the Company be changed and removed from San Francisco, California, to the City of Auburn, County of Placer, State aforesaid, and that notice thereof be published at least once a week for three successive weeks in some newspaper published in the City and County of San Francisco; and

WHEREAS, at said meeting the consent in writing to said change and removal of Stockholders holding more than two-thirds of the capital stock of the company was obtained and filed in the office of the Company,

NOW THEREFORE, notice is hereby given that the HASKELL GOLD MINING COMPANY (a corporation organized and existing under and by virtue of the laws of the State of California) which has heretofore had its principal place of business at San Francisco, State of California, intends to change and remove its said principal place of business from the said City and County of San Francisco, State of California, to the City of Auburn, County of Placer, State of California.

HASKELL GOLD MINING COMPANY,
By HAROLD T POWERS, President.
By order of the Board of Directors.

NOTICE OF ANNUAL MEETING OF STOCKHOLDERS.

In accordance with the By-Laws of that Company the regular Annual Meeting of the Stockholders of the Jamison Mining Company, for the purpose of electing Directors for the ensuing year and transacting such other business as may properly come before it, will be held at the office of the Company, Room 620 Hayward Building, northeast corner of California and Montgomery Streets, San Francisco, California, at 2 o'clock P. M. on Monday, the 19th day of May, 1902.

By order of the Board of Directors.
SAM W. CHEYNEY, Secretary.

To Stockholders of the Jamison Mining Company:

REMOVAL OF THE SAN FRANCISCO OFFICES OF THE COMPANY.

By order of the Board of Directors, made at a meeting of Tuesday, April 29th, 1902, the San Francisco offices of the Company were changed from 120 Sutter Street to Room 620 Hayward Building, northeast corner of California and Montgomery Streets, San Francisco, California.

SAM. W. CHEYNEY, Secretary.

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MINING AND SCIENTIFIC PRESS.

Whole No. 2181.—VOLUME LXXXIV. Number 19. SAN FRANCISCO, CAL., SATURDAY, MAY 10, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

The Economic Tendency in Metal Mining.

The Amalgamated Copper Co. is reported as arranging to buy a coal mine in Montana to supply fuel to its mining and smelting plants at Butte and Anaconda. The transaction as an instance would not have any special significance. It is, however, more than an instance. It is one of the steps of development in the commercial operation of copper production, which in the beginning increasing the profit margin on production by adding another profit to it, in the end lowers the market sale price of the metal. The profit on the coke consumed in producing copper, which was a cost charge against the copper produced, becomes by the change in ownership an additional profit on the copper production. It is only a fraction of a cent on each pound of copper produced, but to that extent gives the producer, the Amalgamated Copper Co., a commercial advantage in the consuming market against other producers who pay a cost charge for coke consumed instead of receiving double the sum as a profit on copper produced. In the end the competing copper producers will be forced to do just what the Amalgamated Copper Co. is reported as doing. They will own their own coal mines and by doing so restore the equality of competitive conditions. When this happens the market sale price is certain to take a lower permanent level, for a survival of producers will then depend on which ones can then stand with the least possible profit.

The economic meaning of the incident can best be expressed in a very broad generalization. The tendency is to make producing industries self-contained. The producer under the spur of competition finds that he can most successfully protect the profit of his production by eliminating other producers' profits as cost charges. This is effected by making their production subsidiary to his. It is this economic tendency which has developed the steel making business until it embraces as details the mining of all the raw material, iron ore, flux, coal, ores used to make alloys, the transportation of these ores, the manufacture of steel into directly consumable finished forms, and the transportation of the finished production to the consuming point. The last may seem a surprising statement, but it is declared that the substantial consolidation of Trans-Atlantic steamship lines had as one of the business motives inspiring it, the transportation of the steel production of the United States Steel Co. to European markets. Within the last few days the transportation of 1,500,000 tons of steel rails for a railroad in China is stated to be the incentive to the establishment of a new Trans-Pacific steamship line from San Francisco.

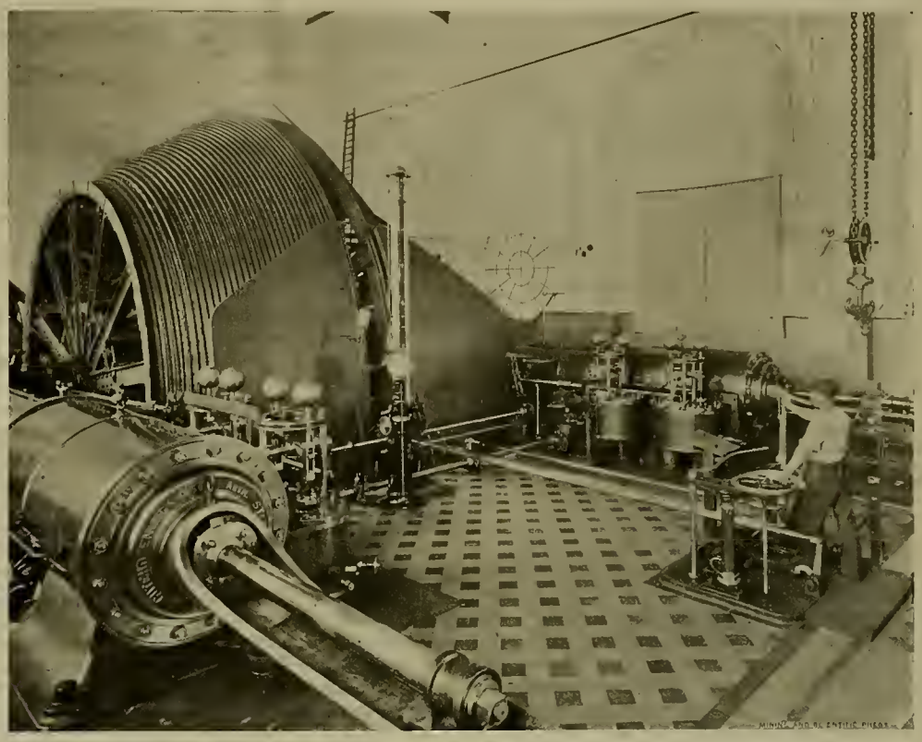

Fig. 1.—Main Steam Hoist at Gewerkschaft Glueckauf at Sonderhausen, Germany.—(See Page 259.)

What has happened in the steel production industry is happening in the copper producing industry, as a result of the operation of precisely the same causes. The consumption of copper has increased enormously, despite the high prices that attended it. The production has been increased even more and competition of producers is compelling the enlargement of the operations of producers to protect profits. The process is proceeding by steps, not all of them at once, not the same steps everywhere, but all enlarging operations, and each one as made proving for that particular producer, not the end, but merely the place for another step.

The Amalgamated Copper Co. has bought coal mines and operates smelters and refineries as details of its business. The controlling interests in it are the controlling interests in the large copper manufacturing industries. It is but a step into New Jersey to combine the two. Another great copper producer refines and manufactures, but does not transport it to market. Another producer owns coal mines and has built its own railroads for transportation in Arizona. Another cuts down transportation by devising and putting in operation a plant which is self-contained in that it mines the ore, reduces and refines it, entirely independent of transportation to it of fuel or reagents.

The point is that copper production does not as it once did, begin and end with copper ore mining, but is a complex commercial business in which the mining is a detail. Ultimately the mine will again become the determining detail, but in this transition stage there are many more important details to be first considered in determining the commercial availability of the mine. Great industrial movements are a succession of steps. At present the tendency is to make the steps rapidly, and even to short cut them to an apparent end as has been done in steel manufacture. It is well for copper producers and copper mine owners to realize that the same movement is in progress in their industry.

Fig. 2.—Underground Station at Gewerkschaft Glueckauf at Sonderhausen, Germany.—(See Page 259.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

San Francisco, May 10, 1902.

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In this number is the beginning of a paper on "Costs and Profits in Pyritic Smelting of Low Grade Copper Ores," by F. H. Prentiss, which should particularly receive the attention of our readers who are interested in pyritic smelting propositions. It is the process of concentration by fire offering the largest possibilities of profits from low-grade pyritic ores. Mr. Prentiss has made an analysis of the process from the commercial standpoint with a view to its utilization under some particularly common adverse conditions which exist in the Pacific Coast States and Alaska. Low percentages of copper and small values in gold and silver with highly siliceous gangues are a common type of this hard pyritic ore. High costs of coke, absence of limestone, and impossible transportation for low value ore are equally common conditions. The determination of the most economic scheme of treatment where the end sought, profit, is a function of several variables, is not a simple matter. The analysis made by Mr. Prentiss simplifies it nevertheless. It is quite possible, making use of the data so fully and clearly presented in his tables, to arrive at possible solutions of some problems in pyritic smelting, more surely, and with much less labor, than if their use was not available. One fact made quite prominent in the discussion, which promoters of pyritic smelting propositions seem to avoid, is the difference between the assay value of an ore and what the writer terms its matting value, the latter being its important commercial value, while the former is chiefly interesting to the entbusiastic company promoter.

Mistakes in mining that can be avoided should not happen. They would not happen but that the cost of the investigation that would avoid them is deemed a waste of good money by many people who mine. It is with difficulty realized that the mistake is quite sure, if made, to prove more costly than the expense of avoiding the mistake. A characteristic attitude on this proposition is disclosed in the self-confidence of a mine operator, who, on being asked by a manufacturer to describe the conditions under which he would have to operate the gold dredger, the construction of which he was negotiating for, replied: "What differences do the conditions make? A dredger is a dredger, is it not? Give me the cost of one." The operator was bidding for a mining failure that could be avoided. What may be termed the mechanics of mining is a science pretty well understood by men who make it serious business. The problems of mining that are purely mechanical can be eliminated of avoidable mistakes by investigating them in advance of trying to do them. It costs something, but the investment in knowledge pays. Surveys and assays cost much less than breaking hard rock. Comparatively a few tons of rock left unbroken in place will pay for the surveys and assays that leave it undisturbed. The same considerations apply in buying metallurgical machinery. The facilities exist for testing in advance its capability. The cost of this is under no conditions a waste, and, no matter how high it may seem, should be paid for the knowledge given in exchange. The avoidance of a mistake by this investigation is sure to prove less expensive than rectifying it.

Cripple Creek, Colo., Mine Drainage.

The Chamber of Commerce at Cripple Creek, Colo., has taken up the question of deep drainage of the Cripple Creek mines with a view to securing a joining of the interests affected in starting actual work without unnecessary delay. It has been suggested that the plan of action be modeled on the irrigation district organizations of California. Experience with this form of organization has not been particularly successful. The conditions of the problem are different in degree, if not in kind, between taking water out of Cripple Creek wet mines and putting water on dry lands in California.

Leaving out of consideration the practical difference between the political organization of irrigation districts, and the private corporate organization which it is assumed it is the intention to provide at Cripple Creek, the system of assessment or taxation of the irrigation districts would be entirely unsuited to a mine drainage problem. In this last there must be an equating between costs and services rendered. The location of the drainage works cannot be so made as to make the cost a matter of flat division based on superficial area of claims. The depth of drainage is an element that must be computed with the surface. The difference in the times that the drainage will become effective as the works advance is also a most important element affecting the incidence of the cost of the works. It is essential, also, that as between proved claims and unknown undeveloped ground there should be such a difference in the incidence of the assessment of cost that unknown undeveloped ground will be neither confiscated nor compelled to advance costs that may never be repaid. It is possible to adjust even this question satisfactorily in advance.

The fact can be conceded without argument that the construction of a drainage system to great depth will be profitable to the developed mines alone, leaving unproved and unknown ground entirely out of account. The latter should not receive the benefit of drainage, provided the drainage should prove a benefit, without contributing on precisely the same basis as the developed mines. This can be by agreement made a deferred payment for which the production of the ground can be obligated.

It is to be hoped that the owners of mines and mining ground in Cripple Creek district will unite without exception to accomplish this scheme of common drainage. There should be a public sentiment on the matter so strong that the rights of way should be granted without cost or difficulty. The mine owners should so organize that the work would be accomplished and maintained at cost. All possibilities of the kind of opposition which delayed the completion of the Sutro tunnel should be avoided from the start. It should be a pull together on the part of the mine operators and people of Cripple Creek and everybody should be pulling.

Time is a vital element in such an undertaking. Deferring it lessens the values in the ground that make it desirable. Primarily it is the mines above drainage level that the drainage facilities are provided for. The Comstock lode at Virginia City, Nev., furnishes an object lesson in mine drainage that Cripple Creek can study with benefit. Does any one suppose that if its building had been delayed to the '80s that it would ever have been built? Does any one suppose that if it was not built there would be any mining in the Comstock lode now or that there would now be any Virginia City? On the other hand, if the tunnel had been completed ten years earlier, an enormous saving of cost of pumping and hoisting would have resulted during the period of mining of the bonanza ores, increasing the dividends from them and increasing the deep working of the mines while they were making the output to pay the costs.

The Mother Lode in California.

The mother lode in California does not lose its productiveness in gold with increasing years. If changing at all it is increasing its output. Twenty years ago there was just one mine on the mother lode in Amador county operating, and in Calaveras and Tuolumne counties not more than two or three in each. In El Dorado and Mariposa counties none at all were in operation. The change from then is striking. In Amador county, at Plymouth, a dozen mines, unknown or little known twenty years ago, are developing into the producing stage. Going south along the lode the Gover and Fremont mines on the 800-foot level have 120 feet width of pay ore milling up to $7 a ton. The old Keystone mine, at Amador, has a pay lode from 90 to 200 feet wide, on which mining is just commencing. The Spring Hill mine, at the same place, has also a great body of pay ore. At Sutter Creek the Kennedy, Argonaut, Central Eureka, South Eureka and Wildman-Mahoney are all producing from ore bodies — some near the surface, in ground missed in the early exploitation of these mines, others at depths far below what it was considered was the bottom of pay ore two decades since.

In Calaveras county the Gwin mine is increasing its already large output; the Melones has just started up with an enormous body of proved ore blocked out, ready for breaking for the mill. The Sheep Ranch mine, on the east belt of the lode, is proving the beginning of a new mine where the bottom of an old one was supposed to be. All of these in the '80s were considered worked out and were abandoned by the owners; yet they are greater mines to-day than ever before. Another mine, the Royal, is working in a 60-foot wide ore body and considering a 200-stamp mill. In Tuolumne county there is observable the same change from abandoned mines and silent mills to active going concerns more productive than ever before, and more firmly established as to permanence of operation. The preceding records but a small part of the active and successful gold mining of the mother lode. It is not an activity that attracts much outside attention. It is accepted as a matter of course by those who best know it. It is not at all spectacular. No great combinations of outside capital play with it as if it were a pawn in a bankers' game of high finance. It is simply a free, self-contained mining industry, the opportunities of which are not monopolized, simply because monopoly of them is impossible.

Reports are being made of finds of gold-bearing quartz ledges in the vicinity of Happy Camp, Siskiyou county, Cal. The locality is a new one for gold quartz discoveries, though the district was noted between thirty and forty years ago as a good placer mining camp. This late discovery is simply another illustration of the conservatism of the old '49 miner of California, and the persistence of the repute of a mining district. The old California placer miner has always clung to the idea that where there were good placer diggings there could be no good quartz ledges. Consequently, he would not look for or prospect them. Happy Camp, once aquiring the distinction of being a good placer camp, at the same time gained the repute of having no quartz ledges of value. Being far from a railroad, and until quite recently without even a wagon road, the district was passing out of sight entirely until discoveries of copper ores in the Waldo district of Josephine county, Or., attracted prospectors who knew nothing of the old repute of the district. It is these new prospectors who are finding the ledges that are gold bearing. It is too soon to call them anything more than prospects, but there is every reason to anticipate that, developed, some of them will prove to be mines, and give a new lease of life—and a new kind of life—to one of the last of the placer mining camps of the early days of California.

The southern part of California is like the central and northern sections, proving that after a half century's mining there are both new mines to be discovered and old ones to be reopened. From Kern county a report comes of a discovery of lode outcroppings identical, physically and in gold and silver values, with the lodes of Tonopah, Nev.

Concentrates.

SAN JUAN COUNTY, COLO., mines have nearly 20 miles of areal tramway line in use or projected for immediate construction.

A NICKEL-STEEL ALLOY containing 36% of nickel has the lowest coefficient of expansion of any metal known, being 0.0000005 for 1° F.

FRESHLY CUT zinc shavings give better results in the cyanide process than where they have been cut a considerable period of time before use.

THE singing of telegraph poles is really the note of vibration of the wires conducted through the pole to the ear so that sound seems to come from it.

SECRETARY MAHONE has issued the official call for the convention of the International Mining Congress at Butte, Mont., to meet on September 1.

MANGANESE ORE deposits in California are not commercially available at present, owing to the absence of steel-making works on the Pacific coast.

THE mineral in which platinum is found in place as a lode deposit is sperrylite. It is found associated with the sulphide and arsenical ores of copper and nickel.

MANCHURIA, in northern China, has an area of about 400,000 square miles, being about twice as large as France or the State of Texas. It has never been accurately mapped.

SCRAP STEEL is used in making steel by the open-hearth process. The demand for it is increasing with the cleaning up of old accumulations at points near the furnaces.

CONCENTRATES should be briquetted for feeding to a blast furnace to avoid the loss resulting from the blast carrying the finely divided material out through the furnace stack.

THE repeal of the war tax by Congress will make it unnecessary after July 1 of this year to stamp mining stock certificates. All stock transferred before that date is subject to the tax.

A SAVING of a few cents a ton in the costs of a large mine output, where quantity counts, will pay high salaries to the brains that accomplish it, and a profit to the mine operator as well.

COLEMANITE is found in veins or beds on Furnace creek in Death valley, Inyo county, Cal. The deposits are identical with those mined at Calico, Cal., about 160 miles south of Furnace creek.

A VERY small percentage difference in the carbon of coke will account for a noticeable difference in its melting power in a blast furnace. Coke should be bought on assay and the carbon should be at least 86.5%.

SPECULAR IRON is a variety of hematite. It is foliated and micaceous in occurrence and has a high metallic luster. It is a common variety of what is known as hard iron ore in the Lake Michigan iron districts.

EXPERIMENT has disclosed that copper is reduced in strength by being heated, and by being chilled is rendered brittle. Alternate heating and cooling produces molecular changes which deteriorate it for some uses.

THE cost of opening and equipping a zinc mine in the Joplin district of Missouri runs from $5000 to $15,000. The cost of mining and milling is low; great quantities have been mined at 60 cents a ton and milled at 20 to 30 cents a ton.

A GAS-POWER PLANT has been in successful operation for two years at a Nacosari, Sonora, Mexico, mine. All the power is generated at a central station and transmitted electrically. The gas used is a mixture of water gas and producer gas.

THE depth of oxidization in mineral veins varies considerably. In arid regions, as a rule, the minerals are oxidized to much greater depths than in wet regions. A common depth is 50 to 100 feet. In the Anaconda mine at Butte, Mont., the oxidization extended down about 400 feet.

THE drop of stamps in Gilpin county, Colo., stamp mills is from 12 inches up to 16 inches, and in extreme practice up to 24 inches. The speed is from 28 to 30 drops to a minute. The California stamp mill drop is from 4½ to 7 inches and the speed 94 to 120 drops per minute.

IF two shafts are parallel, and there is a high place on the pulley, then a belt will run to the high place; but if the shafts are out of line, and the face of the pulley straight, then the belt will run to the low side, or that closest to the driving shaft. The remedy is to line up the shafting.

A HIGH HEAD OF WATER using a small quantity, as compared with a low head and large quantity, for the same output of power, is usually found to be the least costly installation per horse power. The cost per horse power of the hydraulic end of hydro-electrical power plants in California ranges from $20 to $100.

THE Commissioner of the General Land Office in a letter to the supervisors of the forest reserves says that a person having more than one mining claim on a forest reserve, with timber upon one and not upon another, can remove sufficient timber to the barren claim to do actual development work, and no more.

IN the absence of local regulation, custom, or statute, no record of a location is necessary as a part of the act of location. It is always the best plan to make such a record. One of the essentials of a valid location is public notice that the appropriation has been made. A record of the notice is legal publicity.

THE locating of a valid mining claim which has been interrupted by the ejectment of the intending locator from the ground is not thereby defeated. The intending locator is entitled to the right to complete his acts of location as of the date when they were interrupted, and can take as his own any work done by the ejecting party.

THE width of the proved oil sands in the Bakersfield, Cal., petroleum field is exceptional. The geological conditions are exceptional there. It would seem the more advisable to sink wells near the discovery well of a new field on what would be the strike of the oil sand beds rather than on the dip either above or below the discovered well.

THE cost of cyanide treatment in a typical southwestern Colorado plant, where about 125 tons are handled daily, is stated to be 70 cents a ton—20.5 cents for labor, 3.5 cents for power and fuel and 46 cents for material. Of the latter, 35 cents was for cyanide and 4.5 cents for zinc. The final tailing loss was about 85 cents a ton, divided in value about equally between gold and silver.

IRON RAILS are preferable to steel rails for the underground trackage of mines. They are easier to bend and cut, the extra time that has to be paid for when steel rail is used making it the most costly of installation, even if the flat cost of the steel is somewhat less than iron. The oftener rail has to be taken up and changed, the greater the money difference in favor of the iron rail.

A STANDARD TYPE of electric transformer oil has a paraffine base, is lighter than ordinary cylinder oil and heavier than ordinary machine oil. About 30° Baume is a standard specific gravity. It must have a high flash and fire temperature, low evaporation and be a good insulator. A standard flash test would be about 336° F., fire test 400° F. Such an oil is not at all like kerosene.

IT has been noted in California drift placer mines where close records are kept of the yield of gold that there is little difference in the amount produced per linear foot of channel whether the channel is wide or narrow. Where pay lead is very wide it contains no more gold than where narrow, the latter being, as miners would say, much the richest pay. The same condition can generally be anticipated in living river beds.

CINNABAR can be recovered from a low grade ore by crushing and concentration. The loss of mineral in a properly designed crushing and concentrating plant should be very small. Cinnabar does not slime readily and its great weight aids in concentrating it. Very fine crushing of the ore is not required. Ore containing as low as two-tenths of a per cent of quicksilver has been commercially treated by concentration at a profit.

WHAT is known as the Coolgardie, West Australia, water supply scheme is a pipe line through which 5,000,000 gallons of water is to be pumped daily to a distance of 325 miles through a total lift of 2632 feet from a storage reservoir near Perth to the Coolgardie gold fields. It is estimated that two years more time will be required to complete the construction. The cost of the work which is undertaken by the Government is stated to be $15,000,000.

THE observed velocities of travel of earthquake shocks are not uniform. The differences are probably due to the differences in depth below the surface of the starting points of the shocks compared, and the areal relation of the two points between which the measurement of velocity is made to the areal center of disturbance. A late observation on an earthquake shock in Russia showed a rate of velocity of travel between the two points making records of 40 miles a minute.

IT is a good idea to have a compressed air receiver close to the point of use of the air. Leaving the compressor the air is heated and holds its heat in a receiver close to the compressor. The water in the compressed air is thus not condensed and goes entrained to the air drills, tending to accumulate ice at the exhaust ports. With a receiver well away from the compressor, the air has a chance to cool and condense its water in the receiver, supplying drier air to the drills and forming less ice.

WHAT is commonly called a claim in Mexico is 100 meters square, and any person can locate as many claims in one location as he pleases. It takes about eight claims to correspond with the claims in the United States in superficial area. The bounding planes of a claim extend down perpendicularly on sides and ends. Ten claims make a fair location. Thus two claims wide and five long make a location 660 feet wide and 1650 feet long. The taxes would be $200 a year, Mexican, on such a location. Foreigners can make locations on the same terms and conditions as citizens.

THE General Land Office says that under the provisions of an amendment to section 2294 of the Revised Statutes all affidavits, proofs and oaths of any kind thereafter made by applicants and entrymen under the homestead, pre-emption, timber culture, desert land and timber and stone Acts may, in addition to those now authorized to take such affidavits, proofs and oaths, be made before any United States commissioner or commissioner of the court exercising federal jurisdiction in the territory, or before the judge or clerk of any court of record in the land district in which the lands are situated. In case they be taken out of the county in which the land is located, the applicant must show by affidavit that it was taken before the nearest or most accessible qualified officer.

IN considering the establishment of mining and metallurgical industry based on the production of a metal or mineral, the market consumption of which is limited, the effect of the new supply, particularly if it be a large one, on the market price must be taken into account in advance. It is not safe to assume that the price will be maintained with the new supply in the market. This applies particularly to the high-priced but little used metals. Doubling the supply on the market is certain to break the price and anticipations of profit based on it.

IN installing a slip joint pipe line for a hydraulic mine or for the water delivery to a water wheel the construction is begun at the lower end, each successive length of pipe being slipped into the one in place. The practice is to have the fit of the slip tight. In joining lengths in the line a common practice now is to surround the large end of the length in place with a strip of burlap saturated with kerosene or coal tar. This is fired and heats the end of the pipe, expanding it so that the small end of the next length slips in easily. The pipe cooling, the joint shrinks tight.

A CO-OWNER in a mining claim cannot by relocation succeed to the interest of his co-owners who do not join in the relocation, even though through failure to perform the assessment work the claim is forfeit. His relocation inures to the benefit of all his co-owners. If he procures the location to be made by a third party and then takes title by deed the essence of the act is not changed. His act must still inure to the benefit of his co-owners. The Supreme Court of Utah ruled that the proper course of proceeding by which the co-owner could divest his associates of title is to do the assessment work and then advertise his co-owners out in the manner provided by the statute.

A SIPHON can be used to drain a shallow shaft, one not more than 25 feet depth near sea level, and of lesser depth, dependent on altitude above sea level. The length of the discharge arm is of no consequence if its outlet end be lower than the inlet end of the siphon in the shaft. A hose would do as well as a pipe, the size depending on the quantity of water that would be coming into the shaft sump after the accumulated water had been discharged. If the depth of the shaft exceed the limits noted, the siphon apparatus could be used with a stream of water turned into it as a jet, creating a suction and providing a driving or lifting force additional. The apparatus then, while commonly termed a siphon by miners, would really be a simple form of hydraulic lift pump.

GIVEN the pressure per square inch of water at a circular nozzle or tip, and the diameter of the nozzle orifice, the quantity of water in cubic feet that would be discharged per minute is a calculation from the formula: discharge $= d \times .7854 \times v \times 60$, in which d is the diameter of the nozzle in decimals of a foot, and v the velocity of the stream in feet per second. To determine v, divide the given pressure per square inch by .434; the quotient will be the effective head h. Then $v = \sqrt{64.4 \times h}$, or from a table of spouting velocities under different heads the velocity can be read directly. The point is to get the pressure at the nozzle accurately. It should be read from the pressure gauge, with the water discharging through the nozzle. Also it should be determined anew for each diameter of nozzle.

CURRENT WHEELS mounted on anchored scows are in successful use for developing some of the power of swift-flowing rivers. The velocity of the current of such a river is made by the fall—that is to say, it is the effect of the head or height of fall of the water. The work done by a stream current is measured just as if it was falling water, and is the weight of water striking against the buckets of a water wheel in a given time multiplied by the height of fall required to produce the velocity. Determining by experiment the velocity of the stream flow in feet per second, the corresponding head or height of the fall can be taken from a table giving theoretical velocities for different heads, or it can be calculated by the formula: $h = \frac{V^2}{64.4}$. The wetted or submerged area of a bucket or paddle of the water wheel in square feet, multiplied by the second velocity in feet, multiplied by 62.25 pounds, multiplied by the head in feet, and multiplied by 60, gives as the product the theoretical foot pounds of work per minute. Dividing this by 33,000, the quotient is the theoretical H. P. The effective H. P. developed in the wheel shaft is from 30% to 40% of the theoretical. In estimating to plan the building of a current water wheel, it is safe to assume a third of the theoretical power as effective power. The rim speed of the wheel when working under full load will be one-half the current velocity. Requiring a known H. P. and being given the velocity of stream flow, the depth and length of the water wheel paddles required to produce the power, and the diameter of the wheel to give a desired number of revolutions per minute, can be calculated. The fixed straight paddle wheel is a satisfactory type of current water wheel. A type used in steamer paddle wheels, in which the paddle enters the water vertically, has been devised. There is also a type patented in which the wheel is set in the current with the shaft vertical, the paddles feathering and turning the edges, instead of the faces, as they are revolved against the current.

Costs and Profits in Pyritic Smelting of Low-Grade Copper Ores.

Written for the MINING AND SCIENTIFIC PRESS by F. H. PRENTISS, E. M.

A mine examination recently made hy the writer showed a wide hody of ore of fair assay value, low in copper and high in silica. With expensive coke and no available fluxes other than harren limestone the profit of smelting would he unsatisfactory, and as it would also he out of the question to concentrate the ore for shipment, the only suitahle method seemed to be to use the concentrates of the lower grade and more siliceous ore in fluxing the higher grade and less siliceous ore, and hy utilizing their heat values to also reduce coke expense. The first calculations are hased upon a slag carrying 50% silica, hut are afterwards extended to slags running from 30% to 60% silica, and in like manner concentrating losses are taken up between 10% and 40%, as well as variations in blast temperature from that of the atmosphere to 1000° Fahr. ahove. Ores are assumed to vary from nearly pure quartz to nearly pure pyrites. Allowance is made for the effect of these variahles upon the various items affecting costs, losses and profit.

EXPLANATION OF TABLES.—Calculations are hased on the following data:

Matte is to carry 50% copper.
Slag is to carry 50% silica.
Hot hlast is to be heated 1000° F.
Price of coke is taken at $15 per ton (2000 pounds) delivered at the smelter.
Limestone at $2.50 per ton delivered.
Wood at $3 per cord delivered.

The cost of mining ore (including delivery) is taken at $2.25 per ton.

The cost of concentrating ore is allowed at 50 cents per ton, and the cost of hriquetting concentrates at $2 per ton.

The loss of copper in smelting is allowed as heing one-half per cent of the slag, and the silver loss is supposed to vary from 20 cents to 30 cents per ton of ore in proportion to hlast and slag.

As the hriquetted sulphurets take the place of limestone in the change they add nothing to the cost of smelting, and on the contrary have a credit value due to what they save in coke and limestone. In fact, on account of the very high per cent of silica carried hy the ore and the high cost of coke and limestone, the prohlem hecomes one of eliminating a part of the silica by concentration and of using the concentrates to flux the remaining silica so as to avoid the use of barren limestone flux, and to reduce the coke requirement to a minimum.

Estimates of costs and profits of smelting are all hased upon a daily capacity of 100 tons of ore—not counting fluxes or ore that has heen concentrated and hriquetted.

For general and office expenses and taxes an allowance is made of 17 cents per ton of ore mined. This hecomes a minimum of ahout $5600 a year (counting eleven working months) when the quantity mined does not exceed 100 tons per day. When less than 100 tons of ore is smelted (not counting fluxes or concentrates), or when less than 100 tons is mined per day corrections must he applied as given in the tahles.

To use the tahles, first ascertain from the analysis of the ore, the amount of silica in excess of the quantity that is neutralized by the FeO, CaO and other hases in the ore (for a 50% silica slag). This gives the types (A, B, C, etc.), in following tahle.

In case the percentage of FeS_2 does not tally with the percentage given in the table, an allowance may he made hy adding to or suhtracting from the profits (per ton) 5.7 cents per unit difference of FeS_2.

The assay value of the ore is not to be used, hut the matting value, that is, the selling value of the gold, silver and copper in the matte at the mine, gold ahout $19.50 per ounce; silver, 95% of New York quotation, and copper New York quotations less the freight and treatment charges which (on 50% matte) are ahout 5 cents per pound of copper. Hence with copper in New York at 15 cents its value in matte at the mines would he about 10 cents.

The numhers at the hottoms of the columns in the following tahles are to facilitate reference.

Analysis of Ores.

Type.	SiO_2.	Fe.	S.	Al_2O_3 MgO FeO CaO.	Cu.	Excess of Silica.
A	36%	22%	25%	10%	3%	0%
B	39	21	23	10	3	5
C	42	19	22	10	3	10
D	45	17.5	20.5	10	3	15
E	48	16	19	10	3	20
F	51	14.5	17.5	10	3	25
G	54	13	16	10	3	30
H	57	11.5	14.5	10	3	35
I	60	10	13	10	3	40
J	63	8.5	11.5	10	3	45
K	67	7	10	10	3	50
	1	2	3	4	5	6

Type.	*Limestone Required for Flux.	FeS_2 in the Ore.	Tons Per Day of Slag.	Total Tons Per Day of Ore and Flux.	Cost of Limestone.
A	0%	46%	72	100	$ 0
B	10	43	78	110	25
C	20	40	84	120	50
D	30	37	90	130	75
E	40	34	96	140	100
F	50	31	102	150	125
G	60	28	108	160	150
H	70	25	114	170	175
I	80	22	120	180	200
J	90	19	126	190	225
K	100	16	134	200	250
	7	8	9	10	11

*The available CaO is taken as 50% of the weight of the limestone.

Type.	Coke Required Per Day With Cold Blast. Tons.	Cost.	Cost of Wood for Hot Blast.	Coke Required Per Day With Hot Blast. Tons.	Cost.
A	8.0	$120	$41 50	2.5	$ 38
B	10 3	155	45 75	4.2	63
C	12.6	189	50 00	5 9	89
D	14 8	222	54 00	7.6	114
E	17.1	256	58 25	9 3	140
F	19.4	291	62 50	11.1	166
G	21.7	326	66 75	12 8	192
H	24.0	360	71 00	14.5	218
I	26 2	393	75 25	16.2	243
J	28.5	427	79 50	17.9	268
K	30.7	461	83 50	19.6	295
	12	13	14	15	16

Type.	Combined Cost of Hot Blast and Coke.	Cost of Labor, Power, Supplies, etc., in Smelting.	Total Smelting Cost Given by Columns 11, 17, 18.	Cost of Concentrating and Briquetting.*	Excess Cost of Smelt'g Over Concentrat'g.
A	$ 79	$125	$2 04	$1 26	$ 78
B	109	130	2 64	1 21	1 43
C	139	135	3 24	1 16	2 08
D	168	140	3 83	1 11	2 73
E	198	145	4 43	1 06	3 38
F	228	150	5 03	1 01	4 02
G	259	155	5 64	96	4 67
H	289	160	6 24	91	5 32
I	318	165	6 83	86	5 97
J	348	170	7 43	81	6 62
K	378	175	8 03	76	7 27
	17	18	19	20	21

*Cost of briquetting charged against concentrates is ample to include rich slimes.

Type.	*Ratio of Concentration, Allowing a Loss of One-sixth in Weight.	Value of Concentrates as Fuel.	Flux.	Combined Value of Columns 23 & 24.	Loss of Copper and Silver in Smelting.
A	2.86	$1 05	$ 95	$2 00	$ 92
B	3.08	98	88	1 86	99
C	3.33	90	82	1 72	1 06
D	3.60	83	75	1 58	1 13
E	4.00	75	68	1 43	1 20
F	4.40	68	61	1 29	1 27
G	5 00	60	54	1 14	1 34
H	5.71	53	47	1 00	1 41
I	6.60	45	41	86	1 48
J	8 00	38	34	72	1 55
K	10.00	30	27	57	1 63
	22	23	24	25	26

*A deduction is also made of 3% of FeS_2 to cover the iron and sulphur carried into the matte.

Type.	Items Saved by Concentration. See Columns Nos. 21, 25 and 26.	Pounds of Air Per Minute Chemically Required for Fe and S. Lbs.	Coke with Cold Blast. Lbs.	Coke with Hot Blast. Lbs.
A	$3 69	105	102	31.8
B	4 28	97	131	53.3
C	4 86	90	160	74.9
D	5 44	83	188	96.5
E	6 01	75	217	118.1
F	6 58	68	246	141.0
G	7 15	61	276	162.6
H	7 73	53	305	184.2
I	8 31	46	335	205.8
J	8 89	39	362	227.3
K	9 48	32	390	248.9
	27	28	29	30

Type.	Cu. Ft. of Air (1.33% Surplus Required for Cold Blast.	Hot Blast.	Horse Power Required with 20 Ozs. Pressure (with 25% Added for Friction and Slippage). Cold Blast.	Hot Blast.
A	6,270	4,100	43	28
B	6,900	4,580	47	31
C	7,580	5,000	52	34
D	8,210	5,450	56	37
E	8,850	5,880	60	40
F	9,500	6,330	65	43
G	10,210	6,760	69	46
H	10,850	7,210	74	49
I	11,540	7,640	78	52
J	12,150	8,060	83	55
K	12,790	8,510	87	58
	31	32	33	34

(TO BE CONTINUED.)

Interactions of Gold and Zinc.

TO THE EDITOR:—In some investigations of the radiant energy of metals, and their interrelations, I found certain relations between gold and zinc, that I did not find between any of the other metals then tried. This relation was of such a character that I thought it probable that wherever these two metals were together, and free to act, there might he some freak action—hy that term I mean, unexpected results from unknown causes. Precipitation of gold from cyanide solutions hy zinc is noted as attended hy wide variations in results; this recalled to my mind the ahove observations, and I determined to investigate the suhject.

I found four distinctly different forms of precipitation of gold, and one form of some other metal on the gold. There may he others. As they are all important to cyaniders, and suggest where to look for losses, I note them for consideration as:

No. 1. The gold is precipitated in a dark colored flocculent form, which rises readily if the solution be agitated, hut sinks readily in still water. It is easily washed clean from the zinc.

No. 2. This is, at first sight, the same as No. 1, but some of the precipitate adheres to the zinc in spots; on trying to remove these spots with a knife, they hrighten, and show metallic gold strongly adhering to the zinc.

No. 3. There is no flocculent precipitate formed, hut the gold is precipitated on the zinc in a fine granular metallic form; it is easily washed off the zinc, and sinks at once.

No. 4. The gold is deposited on the zinc as a metallic plating.

No. 5. This has only heen ohserved once. I wished to know if an often used solution acted in any way different to a new solution. An often used solution of cyanide was poured on gold filings; for a time all went apparently as usual, the finest particles disappeared, the larger were heing reduced in size, when the largest hecame covered with a white film, somewhat as if mercury was present, hut the usual adhesion of amalgam was ahsent. The whitened grains grew larger and all the remaining gold took on the same appearance. Whether the gold was all displaced, or plated with some metal, was an important question; a visual examination gave no information; the grains were put in a lead cornet, melted, scorified and cupelled, resulting in a gold head of ahout the size due to the gold at the last ohservation before whitening.

Some time later it occurred to me that the cyanide solution was charged with zinc, and the zinc may have heen plated on the gold; zinc was shown to he present in the fusing. If this was zinc on gold, and gold does precipitate on zinc, then a huilding up of one on the other, either way, is shown to he possible.

These five items show the possihilities of shortages, and increase in gold recovery from cyanide solutions where zinc alone is used for precipitation.

Further experiments for a remedy show that a fresh strong solution of cyanide will rapidly dissolve the metallic gold from the zinc, and precipitate it in another form at the same time; suggesting, that after washing away the free precipitate from the zinc, a fresh solution of cyanide he turned on the washed zinc and left for a short time, and the zinc he again washed to recover any fresh precipitated gold.

Jacksonville, Or., April 24. JOSEPH VOYLE.

IN carrying out a new process of treating steel with hydrogen, Bessemer or open-hearth hars or hillets are first heated in an ordinary closed-air furnace, subjecting them to a heat sufficient to appreciahly open the pores or grain of the metal and slightly greater than that of the recalescent point. The hillets, when at a hright red heat, are quickly withdrawn, laid on a suitable support on a sand floor, and at once covered with a suitahle honnet, into which is injected a jet of pure hydrogen. By contact with the metal the gas will be ignited, serving to effect the exhaustion of what air is initially inclosed in the honnet with the hillets. When the air is completely exhausted, the metal remains in a hath of pure hydrogen gas, which it freely ahsorbs. The metal remains exposed to the gas for fifteen minutes, or longer, if desired. When the metal cools, the hydrogen is retained, both mechanically and chemically, the hydrogen comhining with the carhon.

NATURAL GRAPHITE is a gritty and inferior material. A hard-cutting siliceous ash will make graphite useless as a luhricant, and the merit of some natural graphite esteemed for this purpose rests on its mineral contents chancing to he soft or even luhricative. With artificial graphite this good property is procured hy design instead of by accident. All forms of carhon, crystalline or amorphous, are converted in graphite at a temperature sufficiently high. Artificial graphite is manufactured hy heating directly any kind of carhon sensihly free from mineral matter. A method, differing from this in principle, consists in dissolving carbon in a fused metal until it is saturated at a high temperature; on cooling, a portion of the carbon is thrown out of solution as graphite.

Automatic Regulation of Discharge From a Reservoir.

Written for the MINING AND SCIENTIFIC PRESS by F. RIGAUD.

I assume for this discussion the outlet wall of the reservoir to be vertical with a discharge opening of rectangular form at the foot of the wall. The fixed height of this opening I call "2a" and the variable length "C." Across this opening is a gate horizontally sliding, by which the length of the opening is adjusted. From the middle point of the opening the height or pressure of water, "h," is measured. The regulation of the discharge is affected by moving the gate, shortening or increasing the length of the opening, so that the discharge, "G," is kept constant, when the pressure under which the flow takes place varies from "H," its maximum, down to "a," half the height of the opening. With a less pressure the opening is not full of water and the formula does not apply. The discharge is assumed to be free in order that the coefficient of discharge, "K," about 0.62, shall be constant. All quantities are estimated in feet, square feet and cubic feet per second. Value of "g," gravity, is 32.16 per second.

The formula of discharge is

$$G = 2KaC\sqrt{2gh}.$$

At starting point, when h has its maximum value H, for a given value of G we may calculate

$$2Ac = \frac{G}{K\sqrt{2gH}}$$

and then choose at will the form of the opening; this being possible because 2a and g are constant. We have from formula

$$C\sqrt{h} = \frac{G}{2Ka\sqrt{2g}} = \text{constant}.$$

It is easy to draw the curve $C\sqrt{h} = C^1$, taking h for ordinate and C for abscis, a kind of hyperhola of third degree, and if we make this curve of metal running between two buoys directed by vertical poles carrying and moving the gate as shown in Fig. 1, the opening will make a constant discharge.

This condition is realizable in practice, if not directly because of heavy friction, at least by a combination of mechanical devices, as indicated in Fig. 1.

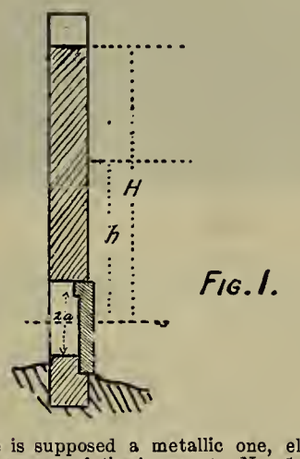

FIG. 1.

The curve is supposed a metallic one, electrically connected to one of the buoys, to No. 1 if water rises, to No. 2 if water lowers, and to a system of electric reversible motors. When there is no contact, the current does not pass through, and there is no motion. When there is contact, the motor runs, and by a crane carries the gate to right or left hand, diminishing or enlarging the opening until the contact is lost by the metallic curve, at such distance that the discharge is exactly constant.

The preceding solution of the question is the most easy to explain and to calculate, but the mechanical apparatus is rather complicated. Other arrangements may be adopted. One, which I consider the preferable, necessitates the use of the higher mathematics for the development of the formula.

Let us suppose a buoy fixed to the longest branch of a lever MN (Fig. 2), with a fixed point at N; and at point O the gate sliding vertically over an opening having the marked form a b c p. When water is at its highest level, only the square or rectangle a b c d is opened; when water lowers, the area of opening increases by a curvilinear triangle a e f, when water arrives at level a the gate must be at level c d p and the opening is at its maximum.

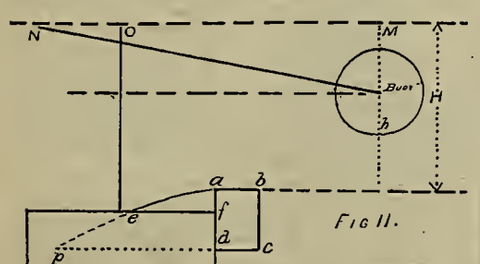

FIG II.

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The problem is to calculate the curve a e p in such manner that the discharge is constant.

I call a h = B, a d = A, H the height of water level above a h and G the given discharge. At starting point we have

$$G = KAB\sqrt{2g(H+\frac{A}{2})} \qquad (1)$$

wherefrom we calculate B if we fix at will the height A.

Then, from the position of the lever, the proportion

$$\frac{NO}{NM} = \frac{a\,d}{H} = \frac{A}{H} \qquad (2)$$

and if water lowers from H to h, the gate falls to f, and calling y this fall, a f, we have

$$y = (H-h)\frac{A}{H} \qquad (3)$$

and we will call x the length f e.

At this moment the discharge through a b c d is $KAB\sqrt{2g\left(h+\frac{A}{2}\right)}$ and the discharge through the triangle a e f is $K\sqrt{2g}\int_0^y x\,dy\sqrt{h+y}$. The sum of these two discharges must be equal to the given quantity G; and suppressing the common factors $K\sqrt{2g}$, we have

$$AB\sqrt{h+\frac{A}{2}} + \int_0^y x\,dy\sqrt{h+y} = AB\sqrt{H+\frac{A}{2}}.$$

The integration is possible by parts

$$\int_0^y x\,dy\sqrt{h+y} = \frac{2}{3}x(h+y)^{\frac{3}{2}} - \int\frac{2}{3}(h+y)^{\frac{3}{2}}dy = \frac{2}{3}x(h+y)^{\frac{3}{2}} - \frac{2}{3}\frac{2}{5}(h+y)^{\frac{5}{2}}$$

and because the integration is taken from 0 to y, and for x=0 y=0 we have $-\frac{4}{15}h^{\frac{5}{2}}$ the equation of the curve is, after replacing h by its value given above (3)

$$AB\left(H+\frac{A}{2}-y\frac{H}{A}\right)^{\frac{1}{2}} + \frac{2}{3}x\left(H+y\frac{A+H}{A}\right)^{\frac{3}{2}} - \frac{4}{15}\left(H+y\frac{A+H}{A}\right)^{\frac{5}{2}} + \frac{4}{15}\left(H+y\frac{H}{A}\right)^{\frac{5}{2}} = AB\left(H+\frac{A}{2}\right)^{\frac{1}{2}}$$

wherefrom

$$x = \frac{3}{2}AB\left[\frac{\left(H+\frac{A}{2}\right)^{\frac{1}{2}} - \left(H+\frac{A}{2}-y\frac{H}{A}\right)^{\frac{1}{2}}}{\left(H+y\frac{A+H}{A}\right)^{\frac{3}{2}}}\right] + \frac{2}{5}\left(H+y\frac{A+H}{A}\right) - \frac{2}{5}\frac{\left(H-y\frac{H}{A}\right)^{\frac{5}{2}}}{\left(H+y\frac{A+H}{A}\right)^{\frac{5}{2}}}$$

This equation is complex, but it is sufficient to calculate the value of x for three or four values of y.

Calculating this for a special case, I assume in the reservoir 12 feet of variation of level, and a constant discharge of 100 miner's inches, or 10,000 cubic feet, per hour, or $\frac{100}{36}$ cubic feet per second. g=32.16; k is about 0.62. The formula gives $\frac{100}{36} = 0.62\,AB\sqrt{2}\times 32.16\times 12$, or AB = 0.16 square foot. And I take A = 0.50, B = 0.32, when I make the calculation of x for five values of y; but I must observe the fifth value is not attainable, because when h is $\frac{A}{2}$ the opening is no longer full and works as a weir.

$y_1 = 0.10$	$x_1 = 3.73$
$y_2 = 0.20$	$x_2 = 6.01$
$y_3 = 0.30$	$x_3 = 7.53$
$y_4 = 0.40$	$x_4 = 8.78$
$y_5 = 0.50$	$x_5 = 9.85$

These figures show the curve convex as in Fig. 3.

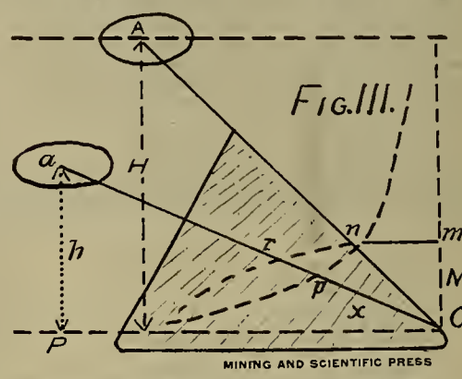

FIG. III.

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If the variation of level does not exceed 5 feet, the following scheme would answer. The gate is revolvable around a point of the opening, and connected to a buoy A. On Fig. 3 I take the buoy when water is at its maximum, and in an intermediary position. I assume the starting angle A O P, when water is at height H, is 45° or $\frac{\pi}{4}$, M being the heigh tof the opening, g the discharge. We have at this moment

$$G = K\sqrt{2g}\,\frac{M^2}{2}\sqrt{H-\frac{2}{3}M}.$$

When water is down to h we have $G = K\sqrt{2g}\,\frac{M}{2}$

$$\sqrt{h-\frac{2}{3}M} + K\sqrt{2g}\int_x^{\frac{\pi}{4}} r\,dx\sqrt{h-\frac{2}{3}r\sin x},$$

and from the figure the conditions $\frac{h}{H} = \frac{\sin x}{\sin\frac{\pi}{4}}$, thence the differential equation of the curve

$$\frac{M}{2}\sqrt{H-\frac{2}{3}M} = \frac{M^2}{2}\sqrt{\frac{H\sin x}{\sin\frac{\pi}{4}}-\frac{2}{3}M} + \frac{1}{2}\int_x^{\frac{\pi}{4}} r^2dx\sqrt{\frac{H\sin x}{\sin\frac{\pi}{4}}-\frac{2}{3}r\sin x}$$

This equation is resoluble, but gives an equation of seventh degree between r and x, by calculations too long to be given place here; but the equation is very near the equilateral hyperhola

$$r = M\sqrt{\frac{1}{\sin x\cos x}}$$

very easy to draw and disposed as marked on Fig. 3. M is calculated by the first formula.

As an example, suppose we assume 6 feet variation of level and we have 100 miner's inches. K = 0.62, g = 32.16. Then we have $\frac{100}{36} = 0.62\times\sqrt{64.32}\times\frac{M^2}{2}\sqrt{6-\frac{2}{3}M}$; therefrom M = 0.69 foot, and length O B = r = $M\sqrt{2}$ = 0.97 foot.

A HYDRO-ELECTRIC PLANT has just been completed at Vouvry, on Lake Geneva, Switzerland, by La Societe de la Grande Eau, in which the tangential wheels, of which at the present moment there are four of 500 H. P. installed, work under a head of no less than 3150 feet. The principal conduit consists, in the first place, of a pipe 31½ inches in diameter, which is later subdivided into three of 19.7 inches as the pressure increases nearer the bottom of the fall. Each of these branches ends finally in two pipes, each 13.4 inches in diameter. For the laying of this conduit an aerial tramway was installed, having a length in plan of 5609 feet, the rise in this distance being 2985 feet. The pipes forming the conduit varied in length from 16.4 feet up to 26.25 feet, the heaviest weighing just one ton. The cable standards were built of timber, the longest span measuring 1970 feet in plan. The cables used were of cast-steel wire, having a breaking strength of 220,000 pounds per square inch. They were 0.78 inch in diameter, their total strength being twenty tons. The factor of safety was accordingly only about 2½; but in view of the temporary character of the installations, this was deemed quite sufficient by the contractors for the work. For working the line an electromotor of 20 H. P. was employed.—London Engineering.

The Portland Cyanide Mill.*

Tbis mill is located at Gayville, at tbe mouth of Blacktail gulch, a short distance from Central. It was originally a stamp amalgamation mill; hut, as this process could not treat the ores from Portland successfully, cyaniding was installed. The mill is a wet-crushing one, crushing with cyanide solution in the battery, separating the resultant slimes and sands and treating each separately. Tbe mill bas been in operation as a cyanide plant since about October, 1900, at that time having a capacity of thirty tons per day, tbis heing tbe limit, due to the lack of facilities for handling more slimes. More tankage was tben provided for and the capacity of the mill is now sixty tons of ore per day. Tbe ore treated comes from tbe Portland district.

THE NATURE OF THE ORE TREATED.—Tbe ore is from the Potsdam and is very siliceous. Tbe gold is very finely disseminated and fine crushing is required to liberate it. Most of the ore treated is well oxidized.

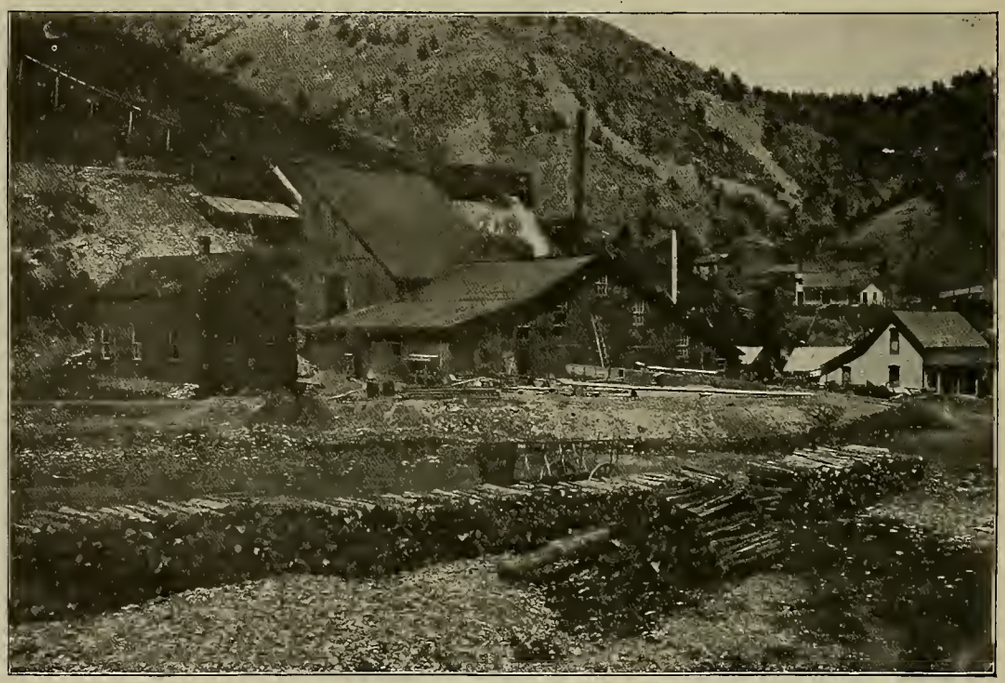
THE WORKING SCHEME OF THE PORTLAND MILL.—

Ore from R. R. cars.
By Chute to Bins.
By Cars to Crusher Floor.
Grizzley. 4 ft. x 4 ft. 1½ inch space between bars.
oversize | undersize.
Blake Jaw Crusher
20x12 in. jaw opening, crushes to 1 in. cubes.
Main Storage Bins.
Challenge Feeds. | Cyanide Solution from standardizing tanks.
Four 5 Stamp Batteries, 16 mesh screen.
By Launder to Sump.
Sand Pump.
Distributing Box, 2x2 feet cross section, 1½ feet deep.
4 Radiating Pipe Lines, 5 inch iron pipe.
Each to a Separate Box, 3x6 feet cross section, 5 feet deep (2 compartments).
Slimes (overflow) | Sands (settlings)
Overflow Launder (covered) 12x14 inches cross section. | Leached with Weak and Strong Solution and Wash Water.
Main Central Launder. | Tailings, sluiced out. | Solution.
8 inch Forked Galvanized Iron Pipe. | Zinc Boxes.
Slimes Settling, Vat No. 1 or No. 2 (alternately). | Solution. Product.
Settled Slimes, plus Barren Solution from Sump Tank X. | Syphoned Solution. | To Sump and Standardizing Tanks.
Sump Tank B.
Slimes Pump.
Storage Tank C (by pump).
Slimes Settling Vat No. 3, plus some water to fill. | Filter Tank K (sand filter).
Settled Slimes, plus barren solution from Tank X. | Syphoned Solution, (same as before). | Filtered Solution. | Overflow.
Slimes Pump. | Zinc Boxes. | To Sand Tanks for leaching and clearing.
Slimes Settling Vat No. 4. | Precipitate. | Solution.
Settled Slimes, plus barren solution from Tank X. | Syphoned Solutions (same as before). | To Sump Tank X.
Slimes Pump.
Slimes Settling Vat No. 5.
Settled Slimes and Wash Water. | Syphoned Solution (same as before.)
Slimes Pump.
Slimes Settling Vat No. 6.
Settled Slimes Sluiced Out. | Syphoned Solution (same as before).

THE CRUSHING MACHINERY.—The grizzly is a sbort one, 4 feet long and 4 feet wide, just above tbe jaw crusher. The spaces are 1½ inch wide. The rough crushing is done in a Blake jaw crusher, having a jaw opening 20x12 inches, and bence the ore requires very little sledging, and for this reason the crusher possesses a decided advantage over the smaller size gyratory crushers. Tbis crusher crushes the sixty tons that pass through the mill in seven to eight hours, avoiding a night-crusher shift. The ore is taken from the main storage bins, which are fed by tbe crusher, hy four cballenge feeders and fed to the four batteries of five stamps each. Tbe stamps are 900-pound stamps, 100 drops per minute, crushing through a 16-mesh screen with a 2 to 2½-pound cyanide solution. The amount of solution is about four tons per ton of ore crushed. Tbe screens are covered with canvas to avoid splash, the solution being caugbt in a longitudinal launder, which carries it to the Frenier sand pump, which elevates it above the tanks. (See the working scheme.)

THE SEPARATION OF THE SANDS FROM THE SLIMES.—The Frenier sand pump sends tbe pulp to tbe distributing tank, a water-tight wooden box, 2x2 feet in cross-section, from which radiate four 5-inch iron pipes, each of which can he cut out as desired, one going to the separator box suspended over each sand vat. The separator boxes are 3 feet wide by 6 feet long and 5 feet deep, made water-tight by a double lining and divided into two compartments, so tbat each compartment is 3x3 feet in cross-section and 5 feet deep. Each compartment has a 12-inch circular discharge gate in the bottom, which is closed tight against its frame by a rubber gasket. This gate is similar to a type of bottom-discharge gates for cyanide vats. Tbe pulp is led into one compartment, the sands settling out, while the slimes overflow hy a side gate into a covered launder, 12 inches wide and 4 inches deep, which in turn discharges into the main central launder, taking the slimes from all four of tbe separator boxes. Only one hox, however, is in use at a time. Tbis main central launder ends in a forked 8-incb galvanized iron pipe, so that the pulp can be discharged either into slime vat No. 1 or No. 2, according to which one is empty and ready for tbe cbarge. Wbenever one compartment of a separator box is full, the pulp is deflected to the otber compartment, while the accumulated sands are discharged into the sand vat below by means of the hottom-discharge gate. When crushing througb a 16-mesh screen the amount of slimes is about 40% to 50% of the ore crusbed.

THE TANK CAPACITY OF THE MILL (see plan of tanks).—Tbere are four sand leaching vats, of cedar, 16 feet in diameter and 6 feet deep. In all there are six slime vats, three of which are 16 feet in diameter and 8 feet deep, two are 12 feet in diameter and 8 feet deep and one is 10 feet in diameter and 8 feet deep. Tbere are four tanks for the storage of solution, two of whicb are standardizing tanks and two are tanks which hold the syphoned solution from the slime vats before it goes to the filter tanks. They are, approximately, tbe size of the smaller slime vats. Tbere are also two sump tanks, or barren solution storage tanks. "Barren solution" is the solution as it issues from the extractor hoxes, low in free cyanide. Tbis is the solution with which tbe slimes are treated after tbeir first settling. These sump tanks are 16 feet in diameter and 8 feet deep. The filter tanks are two in numher, about 6 feet in diameter and shallow, provided with a sand and gravel filter. Tbe filtered solution goes to the zinc boxes, while the overflow (wben there is any) goes to the sand vats as weak solution.



Cyanide Mill of the Portland Mining Co., Gayville, S. D.

TREATMENT OF THE SANDS.—It takes about thirty-six hours to charge a tank by means of the separator boxes. Tbe tank is then allowed to drain for about six hours, after wbicb a strong solution, about three pounds of cyanide per ton, is run on and allowed to stand for eight hours. Tben battery or syphoned solution is circulated for a varying lengtb of time, to be finally replaced by about four tons of wash water. Tbe tailings are sluiced out in about 2 to 2½ hours. The total time of treatment is in the neighborhood of eight days. Tbe capacity of the sand vats is sixty-five tons.

TREATMENT OF SLIMES.—The slimes as they come from the separator boxes are discharged eitber into slimes vat No. 1 or No. 2, whichever happens to be free, and when this is filled the slimes are deflected to the other one. About five pounds of lime per ton of ore is added at tbe stamps and greatly aids in the settling of the slimes. It takes about ten to twelve hours for a vat of slimes to settle. Then the supernatant solution is syphoned off, the solution running by gravity to either one of the storage tanks. The syphon is a 2½-inch iron pipe with a T fitting at the end, supported on a wooden float. Tbe 2½-inch pipe joins tbe discharge pipe, going out at the center of the bottom of tbe tank, hy an elbow and a tee, so that it can turn on the thread and rise or fall with tbe solution. (See drawing of syphon arrangement.) After the solution has been syphoned off as closely as possible, "barren" or sump solution is pumped into the vat, and, when filled, the resultant mixture is transferred hy the slimes pump to slimes vat No. 3. Tbe pulp is discharged from the vat by means of two 3-inch pipes in the bottom, wbich lead to the pump.

In tbe third slime vat the process is practically repeated, the slimes settling and the solution being syphoned off. In this and succeeding vats tbe method of running on harren solution or water after the first solution has been syphoned off, varies. The harren solution, or water, is introduced by pipes wbich run to the bottom of the vat, the ends heing provided with nozzles, so that the velocity of tbe discharge will serve to agitate the pulp wbile the solution is being run on. Two of the cbarging pipes descend on the sides of the vat, while one descends at the center.

This last is joined to horizontal pipes at right angles to it by a union, so that it can revolve, the whole similar to a garden sprinkler. Tbis device serves to agitate the pulp while solution is being run on. Tbe system of pipes is also connected with a ½-inch steam pipe, so that steam can be introduced to raise the temperature of the mixture. (See drawing of agitating device.)

In this way the slimes are made to pass through five vats, wash water being added in the fifth vat instead of barren solution. Tbe resultant material is then pumped to the sixth vat, where the slimes are settled and the solution sypboned off again. Tbe slimes are tben discbarged by sluicing. Tbe slimes retain about 100% moisture, it not being possible to syphon off closer than tbat.

A Frenier spiral sand pump is used to circulate the slimes pulp from one vat to another. Two of tbese pumps are used, one for the slimes alone and one for raising the pulp from the batteries to the separator boxes. No information is available as regards tbe extraction made on slimes or sands. It is bigher on slimes than on sands, hut questionable whether as much is saved.

PRECIPITATION OF THE GOLD CYANIDE SOLUTIONS.—Tbere are two zinc boxes, and, on account of tbe large volume of the solution from tbe slimes treatment, hoth are used indiscriminately for both weak and strong solutions. Tbe boxes contain eight compartments, whicb are filled with zinc and are 2x2 feet in cross-section and 20 inches deep. Tbey are provided with side launders for clean-up facilities. Lately these zinc boxes have been replaced in part by ordinary whiskey harrels, similar to the plan described for the Wasp No. 2. Tbe precipitation is good, as usual in the district, only that the boxes contain considerable fine sediment from tbe slimes treatment, whicb, however, does not seem to affect the precipitation any. The precipitates often contain considerable silver.

The clean-up is carried on bi-monthly. Tbe slimes are transferred to a small filter tank of the general pattern and washed thorougbly, then transferred to a rectangular sheet iron drying pan and steam dried. The steam-drying device is of galvanized iron, in which the exhaust steam from the mill engine is used. Tbe precipitates, after drying, are treated with dilute sulphuric acid in the usual way and smelted. Before this method was installed the dried precipitates were sold to the Omaha smelters.

METHOD OF SAMPLING THE SLIMES.—The first sample of the slimes is taken at the overflow of the separator boxes by taking a dipperful out at intervals of a half hour. The material thus taken out is collected in a large pail. Wben tbe sample is ready to go to the assay office the pail is half emptied, after thorougb stirring, the remaining half heing the assay

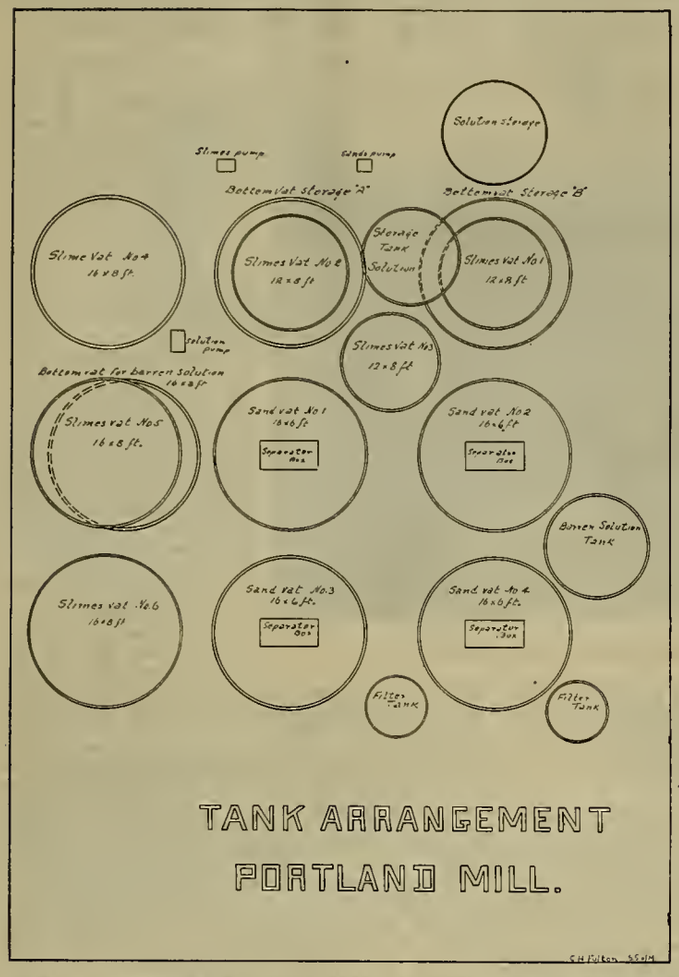
*From Bulletin No. 5, South Dakota School of Mines.

sample. A second sample is taken from the last slimes vat before the slimes are finally sluiced out.

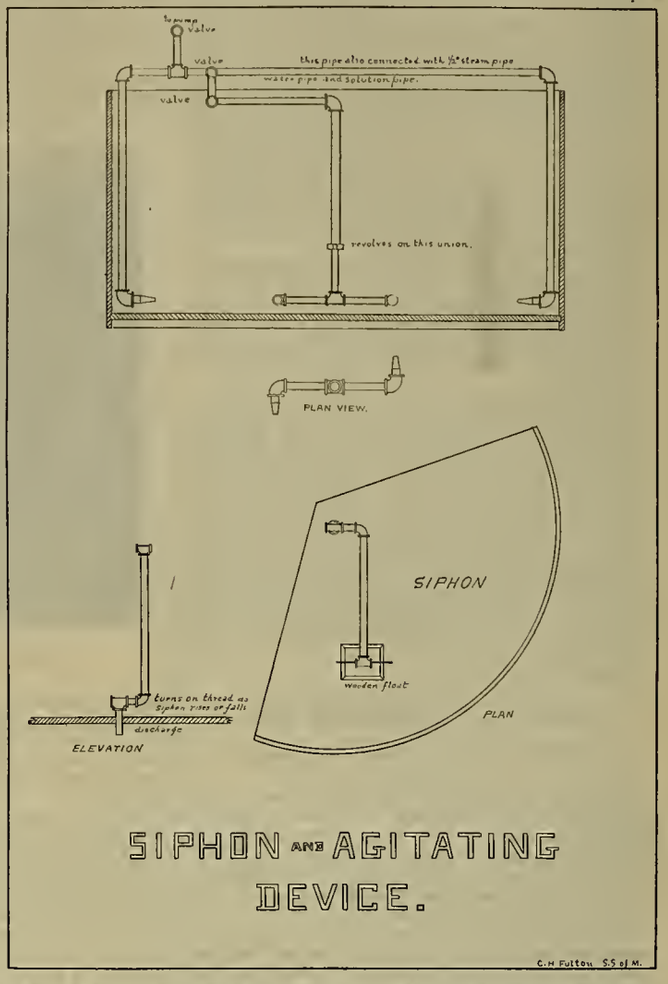
POWER PLANT OF THE MILL.—The steam is furnished by a return tubular boiler, burning mine-run coal, forced draft being employed. The engine is an Erie mill engine, slide-valve pattern, built by Fraser & Chalmers, Chicago, Ill., 60 H. P., cylinder 10x18 inches, 150 revolutions per minute, steam at boiler, usually at eighty pouuds.

NUMBER OF MEN EMPLOYED IN THE MILL.—Day shift: 1 crusher man, 1 battery man, 1 solution man, 1 engineer, 1 slimes man, 1 assayer, 1 assayer's helper, 1 foreman; a total of 11 men. Night shift: 1 battery man, 1 solution man, 1 engineer.

The exact figures for cost at this mill are not available, but the total is probably in the neighborhood of $1.50 to $2 per ton.


Solution Storage
Slimes pump
Sand pump
Bottom Vat Storage "A"
Bottom Vat Storage "B"
Slime Vat No 4 16 x 8 ft.
Slimes Vat No 2 12 x 8 ft
Storage Tank Solution
Slimes Vat No 1 12 x 8 ft
Solution pump
Slimes Vat No 3 12 x 8 ft
Bottom vat for barren solution 16 x 8 ft
Slimes vat No 5 16 x 8 ft.
Sand vat No 1 16 x 6 ft
Separator Box
Sand vat No 2 16 x 6 ft
Barren Solution Tank
Slimes vat No 6 16 x 8 ft
Sand vat No 3 16 x 6 ft.
Sand vat No 4 16 x 6 ft.
Filter Tank
Filter Tank

TANK ARRANGEMENT PORTLAND MILL.



SIPHON AND AGITATING DEVICE.

Electric Powder Thawer.

The electric powder-thawing device illustrated has been made under the direction of Chief Engineer E. F. Stuart of the Trade Dollar Con. M. Co., at Silver City, Idaho, who has heen aided by a number of employes at the mine with practical suggestions, etc., and it seems as though the thawer embodies all the good points of a number of devices, is safe, economical and practical. It has been installed at the mine.

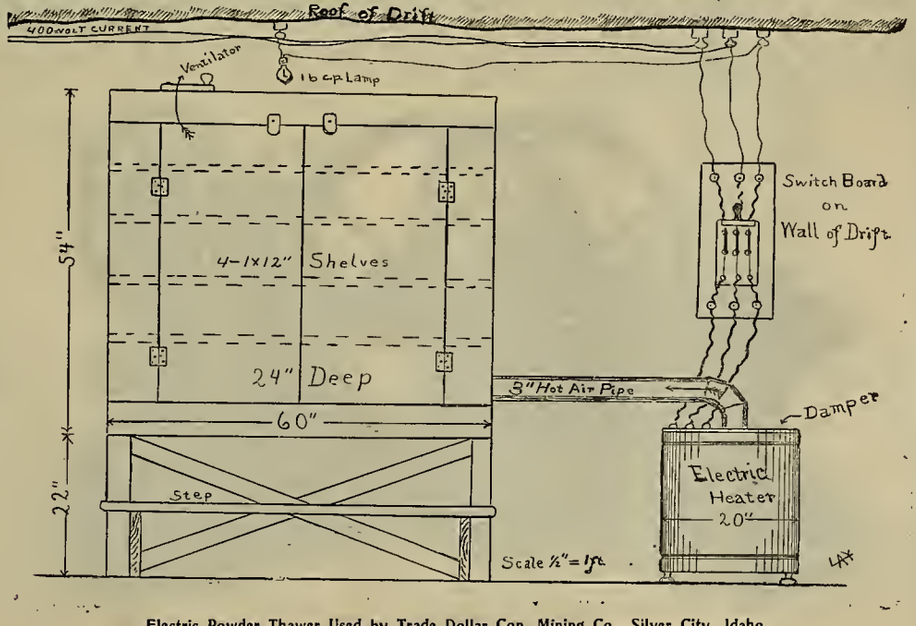
Referring to the diagram, the magazine is 5 feet long, 4½ feet high and 2 feet deep, and is set on a stand 22 inches above the floor of the drift underground. It has four 1x12-inch shelves and two doors. The magazine is lined throughout with galvanized iron. Eight galvanized iron trays, each 12x29 inches, are provided for holding the powder. There are two trays for each shelf. The trays are partially filled with sand. The magazine has a capacity of ahout three boxes of powder. Two thermometers hang inside the magazine, one to check the other, and the temperature is maintained at from 70° to 75° F. A ventilator is provided at the top of the magazine for regulating the air current. This ventilator is so arranged that it can not he entirely closed, therehy giving any gases formed a chance to escape.

The heater is made of thirty coils of No. 22 tinned steel wire, zig-zagged hetween the circular top and bottom plates of the "stove." German silver wire is preferable for this purpose, on account of its greater resistance and less tendency to oxidize; but the tinned steel answers very well. The coils are enclosed with a drum of galvanized iron, several inches larger than the coil frame, and attached to the same with three hent "legs" of strap iron. This drum is open at the bottom. The top is made closed, with openings for the hot air pipe leading to the magazine and also for a regulating damper. The heater stands on porcelain knobs, and the connections with the magazine are thoroughly insulated.

The electric current used throughout the mine is of 400 volts, and this voltage is employed in the heater. An ingenious method is employed to illuminate the magazine with a 110-volt 16 C. P. lamp. One wire of the lamp is attached to the main 400-volt line, while the other is carried through the switchboard to the heater and attached to one of the resistance coils—a sufficient numher of coils being cut in to equalize the higher voltage of the first wire. The lamp hangs in front and just ahove the magazine, giving plenty of light for the man in charge of the thawer.

In operation, from two to three hours are required to thaw the powder, when it is taken out of the trays and repacked in the powder boxes, to he used as required. By covering the boxes with gunny sacks, etc., the powder will remain thawed and in proper condition for use for several days.

The company has placed this thawing magazine in a "stub drift" from one of the main crosscuts. A hranch from the compressed air pipe line is run into this drift and the air is "blown out" twice daily, for the purpose of removing gases or fumes arising from the thawer. While close watch is maintained to keep the magazine at uniform temperature of about 70°, it has heen demonstrated that the maximum heat—with damper closed and heater at full capacity—does not exceed 80°, which is below the danger point. The company has put in three additional thawers of the same description—one at the Dewey mine and two at the Black Jack.—The Owyhee Avalanche.



Electric Powder Thawer Used by Trade Dollar Con. Mining Co., Silver City, Idaho.

Gold Mine Hunting in Arizona.

TO THE EDITOR:—It is now rather slow work endeavoring to sell "copper prospects," or even copper mines. Just three years ago we were hunting good gold prospects in Arizona: even spending considerahle money in development machinery and labor. Gold was then the only thing worth considering, and many a weary mile we rode to look at glitteringly described prospects. Copper, for the moment, had no charms for the Eastern investor with ambitious mining views.

A sudden change came. The copper prices took a jump and would-he mine owners jumped with it. Before the middle of 1899 we were as "hot" after cop-

per prospects as before we had heen keen after gold. A little prospect in Arizona, showing a narrow streak of copper ore, we hought for $5000 and sold it in a short time for $20,000.

What is the condition again to-day? Just about as it was three years ago: copper down and rather out of favor, while gold regains first place in mine hunting.

Having heen on the hunt in Arizona so long ourselves for gold, with hut poor success, we feel competent to discuss gold mine hunting there. There are good prospects to he had, hut unfortunately they are frequently adversely situated. For instance, we made a 60-mile drive across the desert at one point, carrying a heavy load of water for the horses as well as ourselves. On this dreary stretch of hot, extremely dusty road, there is hut one watering place. Arriving at the destination we found huge ledges of gold hearing rock, carrying values which would make mining profitahle if the desert did not intervene hetween rock and railroad.

Another fine prospect calls for the construction of a long pipe line, with pumping plant. One has plenty of nice ore, reasonahly near water and railway, hut is within the houndary lines of an Indian reservation. And so we have to go from one point to another in a continual search for a really attractive gold mine.

Another great hindrance to expansion of gold production here is the almost total lack of accessihle customs smelters. This absence of local smelters, making necessary a long haul to El Paso or elsewhere, prevents operations of what is termed "low-grade" properties. There are plenty of veins carrying low-grade sulphide ore, that cannot he made to yield a profit after paying the long-haul freight charges. Properties equally as good as many that are worked at a profit in States where customs smelters are convenient, cannot at this time he worked at a profit in Arizona hecause the ores and concentrates must be shipped a long distance for treatment.

A. B.

Nogales, Ariz., April 28.

Electrically Driven European Mining Plants.*

Written for the MINING AND SCIENTIFIC PRESS by FRANK C. PERKINS.

It has heen demonstrated that electrically operated hoists for use especially in the lower parts of deep mines, and electric motors for haulage in those sections, are far more economical in every way than steam driven machines. This is true largely on account of steam condensation and loss in the pipes carrying the steam to the engines.

Main hoists at the surface, however, are very economically driven hy steam engines, as they are usually placed near the top of the shaft and the steam is not required to he carried any great distance. Such an installation is shown in Fig. 1 at the "Gewerkschaft," Gluckauf Zu Sondershausen, while Fig. 2 shows the loaded cars on the tracks in the mine below near the entrance to the shaft; which is illustrated further in Fig. 3, giving a good idea of

Fig. 3.—Signal Station in Main Shaft Station.

the entrance to the cage and the special signalling apparatus, for advising the operator above when to raise the load. This apparatus was installed by Siemens & Halske of Berlin.

Not only are electrically operated hoists especially convenient and economical, but they are peculiarly adapted to this kind of work on account of the flexibility and safety, permitting also ready extension or change, as mining conditions frequently require.

During recent years the polyphase power transmission system has heen introduced extensively and has found its way into mining plants, proving a valuable means of supplying the necessary power. While direct current is considered hy many as most desirahle and practical for mining locomotives, polyphase machines are coming into extensive use for operating not only electric hoists, hut mining pumps, drills, ventilators and many other types of mining machines. The necessity of having direct current at hand for use for certain classes of electrically driven machines, as at present considered hy some engineers, is met hy the use of rotary converters in substations and changing the alternating current to a direct current of any voltage desired at any place required.

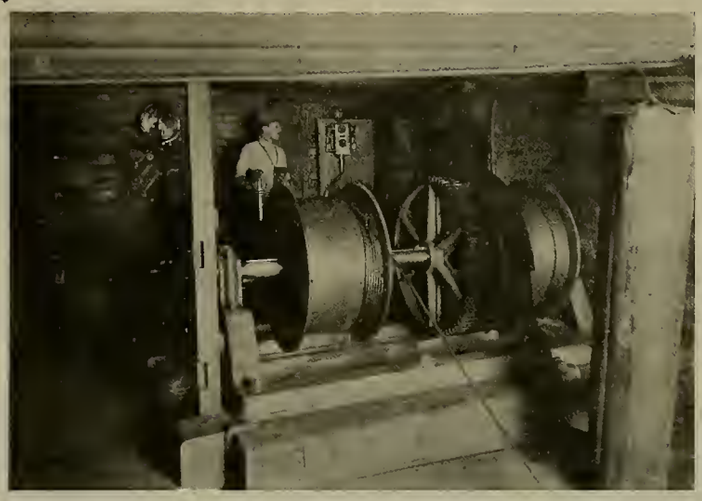


Fig. 4.—Underground Telephone Station and Electrically Operated Hoist.

The latest European practice, where several shafts of a mine are located from 1 to 5 miles apart, is to estahlish a main generating station at one of the main shafts, and at this power house sufficient energy is developed to supply the entire mine, including all of the shafts, with electric power. Polyphase generators are directly coupled to high power compound or triple expansion engines, and the current supplied is raised in potential or generated direct at from 2000 to 10,000 volts and carried over the transmission lines to the various shafts. Frequently an availahle water power makes this development particularly economical, and suhstations or static transformers are located at the various shafts and, after reducing the potential from the transmission line to a moderate pressure, is conducted to the electrically operated hoists, pumps, cutters, ventilators, drills and other mining machinery. Such a plant is in operation at the Erzherzogl. Bergantes at Karwin, Austrian Schlesweig. There are three main shafts, the generating central power station being located at the Hohenegger shaft at Karwin, where a large ventilator is electrically driven hy Drehstrom motors, and an enormous certrifugal pump, as well as the main hoisting apparatus, are driven by polyphase motors. At this power station the potential of the alternating current is raised to 10,000 volts and transmitted hy an overhead line 8750 meters to step-down transformers located at the Albrechtschaft at Petersburg, where a large Drehstrom motor operates the main hoisting machinery and three electric windlasses are also used underground, each driven hy a 35 H. P. motor from a 500-volt polyphase circuit.

Direct current motors are also extensively employed ahroad for operating hoists located hoth above ground and underground, as noted in the accompanying illustration, Fig. 4, the electrical signalling apparatus heing shown at the right of the operator, metallic tubing carrying the conductors to the shaft entrances.

A direct current motor of 50 H. P. capacity is used for mine haulage at the Gewerkschaft Ludwig II at Strassfurt; and a particularly interesting plant using direct current motors for the mine hoisting is the Thiederhall mine at Theide, near Braunschweig, Germany. The central power station of this last plant was illustrated and described in the MINING AND SCIENTIFIC PRESS, March 29, pages 169 and 176.

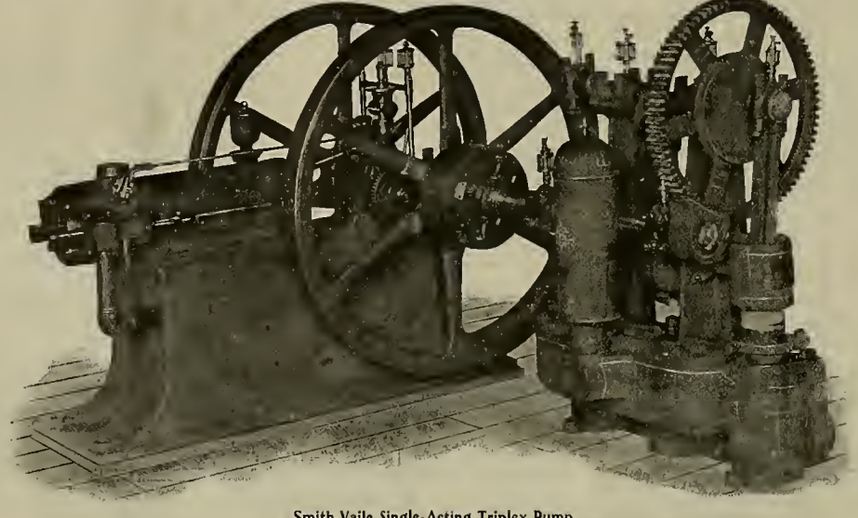
A Commercial Source of Hydrogen.

Of ordinary coal gas, hydrogen constitutes usually about 50%, the remainder heing methane with small quantities of other gases and volatile suhstances. By the use of liquid air the methane and other ingredients were first successfully condensed, leaving the hydrogen quite pure. In recent experiments the use of liquid air has heen dispensed with, and coal gas, previously cooled to 80° helow zero C., has heen passed through a Linde liquid air machine. In this way 3500 cuhic feet of hydrogen per hour was ohtained at an expenditure of from 12 to 15 H. P. By a modification of the process pure methane can also he furnished. This is accomplished hy dividing the process into two stages. In the first the gas is cooled to the temperature of solid carbonic acid, causing the condensation of carhonic acid, henzine and similar hydrocarbon matters.

A SUBSTANCE which may soon he made in quantity and put into use is fused silica. Quartz fused before the oxyhydrogen hlowpipe is in all ways superior to glass as a transparent and refractory material for the construction of apparatus. At present tanks of glass of moderate size only can he cast, hecause of the hrittleness due to its internal tensions. With quartz fused hy the ton, and similarly cast, it should be possible to prepare great vessels indifferent to sudden changes of temperature and practically permanent under the most severe conditions. Investigations in this direction are heing prosecuted.

Triplex Pumps.

Herewith is illustrated a single-acting triplex mine pump, which is an efficient device in connection with the use of gas or gasoline pumping machinery, and such a pump can be started almost instantly and run at high speed. The illustration is of a style of single acting triplex pump that is of suitahle service in mines, manufacturing plants, railway tanks, or similar places, where speed, compactness or economy are desired. It is manufactured hy the Stilwell–Bierce & Smith–Vaile Co., Davton, Ohio, who will promptly furnish any detailed information desired.



Smith-Vaile Single-Acting Triplex Pump.

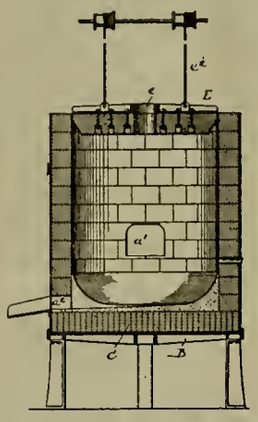
*See illustrations on front page.

Mining and Metallurgical Patents.

Patents Issued April 29, 1902.

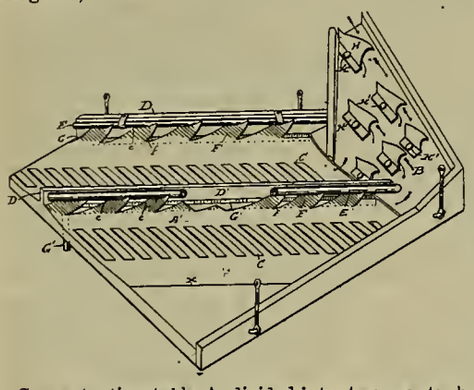
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

FURNACE FOR HEATING OR SMELTING METALS.—No. 698,495; H. H. Hewitt, Buffalo, N. Y.



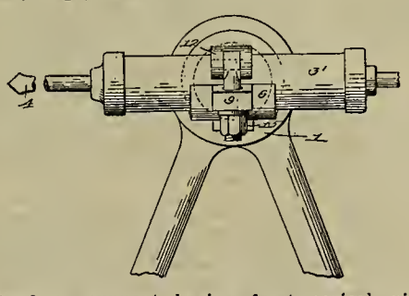
Combustion chamber perforated to admit fuel supply and vertically adjustable cover or diaphragm extending over and serving to define effective volume of combustion chamber, cover or diaphragm being of somewhat smaller diameter than interior diameter of combustion chamber, whereby cover or diaphragm can be adjusted to any desired point within combustion chamber and means for raising and lowering cover or diaphragm.

CONCENTRATOR.—No. 698,737; M. D. Rochford, Kingman, Ariz.



Concentrating table A, divided into two parts by partition rib D, extending centrally from head to tail, row of transversely placed riffles on either side of partition rib extending from head to tail, thin at ends and thick in middle; deflectors F extending from head to tail, and rising above table in gradual curved lines; water supply pipes D, disposed above deflectors and having discharge apertures spaced apart, adapted to direct jet of water onto deflectors, troughs G below surface of table, and adapted to receive and carry off concentrates; and inclined portion B at head of table and connecting therewith, extension being provided with plurality of deflectors H, arranged to spread pulp over concentrating table.

CLAMP FOR ROCK DRILLS.—No. 698,900; F. R. Brown, Unga, Alaska.

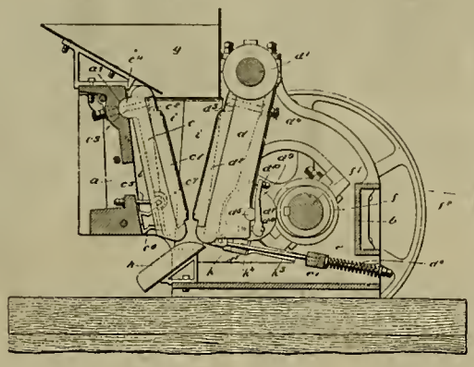


Stand or support having frusto-conical pivot, clamp comprising two oppositely disposed semicylindrical jaws adapted to embrace barrel of drill rod, one jaw being provided with substantially U-shaped base and other jaw being provided with base arranged to slide between sides of U-shaped base, each base on its inner edges being provided with arc-shaped dovetailed grooves, bases embracing pivot on stand, and means carried by ends of jaws for adjustably drawing latter and bases together.

METHOD OF EXTRACTING METALS FROM THEIR OXIDE ORES.—No. 698,739; J. Rudolphs and J. Landin, Stockholm, Sweden.

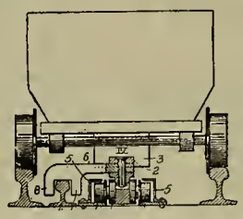
Process for producing briquettes which do not fall into pieces at high temperature and are suitable for reduction, consisting in mixing pulverized oxide ores, carbon, hydrocarbon and organic nitrogen compound or compounds, pressing mixture to bodies of suitable shape and finally heating bodies to 300° to 500° C.

CRUSHER.—No. 698,990; A. G. Morris, Tyrone, Pa.



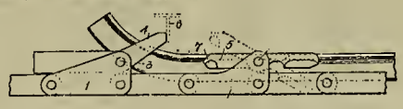
Frame, stationary jaw provided at its upper portion with lateral projection set into cavity in frame, bolt passing through projection of jaw and engaging jaw and frame to hold former in position, bolt being capable of slight sidewise movement in frame to allow jaw to swing, and fracturable spacer set against lower portion of jaw.

BRAKE FOR UPHAULS FOR MINES.—No. 699,024; C. L. E. Schenk, Walkers Mills, Pa.



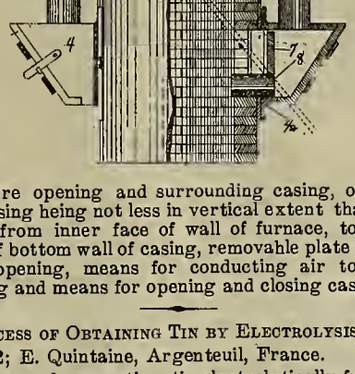
Chain, rail parallel with line of movement of chain, arm pivotally mounted on chain and provided at outer end with fingers projecting down on opposite sides of rail, and means for holding fingers from engagement with rail during forward movement of chain.

DOWNHAUL FOR MINES.—No. 699,023; C. L. E. Schenk, Walkers Mills, Pa.



Chain pairs of oppositely swinging dogs pivotally mounted on chain and provided with weights for holding adjacent or inner ends of each in operative position, depressing plate arranged parallel with line of movement of chain, and lateral extension from front dog of each pair adapted to engage and be shifted by plate.

TUYERE FOR FURNACES.—No. 698,485; W. B. Foster, Utica, N. Y.



Tuyere opening and surrounding casing, opening and casing being not less in vertical extent than distance from inner face of wall of furnace, to outer edge of bottom wall of casing, removable plate having blast opening, means for conducting air to blast opening and means for opening and closing casing.

PROCESS OF OBTAINING TIN BY ELECTROLYSIS.—No. 699,012; E. Quintaine, Argenteuil, France.

Process of separating tin electrolytically from tin scrap, which consists in suspending scrap, as anode, in bath composed of aqueous solution of nitrate of tin to which have been added chloride of ammonia and chloride of tin, suspending suitable cathode in bath, and finally passing electric current through anode, bath and cathode.

Sinking a Shaft by the Freezing Process at Ronnenberg, Germany.

A shaft has recently been sunk by the freezing process at an alkali works at Ronnenberg, near Hanover, Germany. The work was done by the Societe Francaise d'Enterprises, and is described in Le Genie Civil for February 1, 1902.

Soundings made by the Alkali Society of Ronnenberg showed that the bed of salts of potash lay at a depth of about 459 feet. To the depth of 407 feet the ground was largely composed of gypsum, very much fissured and very irregular, but immediately overlying the salt formation was a 50-foot stratum of hard and compact gypsum.

An attempt was first made to cut out the gypsum by a truss armed with cutting tools, and to lift out the water. The shaft was designed to have a clear diameter of 19.68 feet, but for the first 46 feet this diameter was enlarged to 26.56 feet, and it was lined with masonry 2.62 feet thick. Inside the 21.32 feet diameter thus left the cutting truss was operated, and an annular cast iron ring, 19.68 feet diameter, was forced down by powerful hydraulic presses. The water met with down to a depth of 23 feet was lifted by eight pulsometer pumps having a total capacity of 1553 cubic feet per minute.

But during the sinking operation both the masonry and the iron lining began to move under the pressure of the very treacherous soil traversed, and in its total height the masonry showed a divergence of 3½ inches from the vertical. All attempts to straighten the masonry failed, and at a depth of 105 feet the divergence was about 4 inches. Finally, after using sheet piling to reinforce the iron ring, the soil rushed into the shaft from the bottom and filled it to a height of over 26 feet. The water also began to increase in quantity until it amounted to 1412 cubic feet per minute, or almost the capacity of the pulsometers. Under these conditions it was impossible to continue with the method at first adopted, and the company determined to use the freezing process.

The two points to be determined were whether freezing would give good results in this fissured soil, and as the water at Ronnenberg was saline, with 3% salt at a depth of 105 feet, it was uncertain whether the freezing process would be successful under this condition. The first point was decided in the affirmative. And as to the second, experiments were made with different saline solutions of 4%, 8%, 10% and 12% NaCl. These solutions were submitted for twenty-four hours to a temperature of — 12° C. At the end of this time it was found that the 4% solution was almost solidly frozen; the others were less so, and the one of 12% was very little affected at the end of forty-eight hours. As a result it was concluded that while saline solution rendered the application of the freezing process longer in time, it was still practicable by increasing the number of freezing tubes, prolonging the time, and by using more powerful machinery.

The installation included thirty tubes sunk to a depth of 413 feet, on a circle 29 5 feet in diameter. This work was commenced in July, 1899, and meanwhile freezing machines of the Fixary system were installed, double in capacity to those that would have been used for a non-saline soil. In sinking these tubes it was found that the soil penetrated was very irregular. It was unstratified and nodules of gypsum seemed to be embedded in the masses of clay. This formation afforded little chance for water-bearing seams, and this danger was removed. The last tube was sunk on December 10, 1900. On December 5 a beginning was made in sinking the central tubes and in uniting the tubes by a series of circulating pipes.

The actual freezing operation was commenced on January 19, 1901, and by March 27 the temperature at the bottom of the shaft was — 4° C. The actual sinking was commenced on April 18, using the two compressors; but after July 1 only one compressor was employed. To avoid disturbing the surrounding ground, all of the material near the walls of the shaft was removed by hand, explosives being used in the central core only. On July 15 the excavation had reached a depth of 226.3 feet without any accident. It should have been said before that the outside diameter of the new shaft had been fixed at 26.5 feet, with a diameter of 18 feet inside the masonry portion. When the cast iron lining, sunk in the original attempt, was met with, it was removed entirely by thawing out about 3 or 4 inches of the circumference by a current of warm air. A segment was then broken from the ring, and the rest was easily taken out. Each ring taken out was replaced at once by a ring of the new shaft. The shaft was successfully completed some time in August, 1901.

THE Simplon tunnel, according to the progress report for March, now shows an excavation of 22,602 feet on the north side and 14,577 feet on the south side, measured from portals. In that month 2844 men were employed, 2037 working in the tunnel itself. The north heading is in shaly gneiss and micaceous schists, and a mean daily advance of 19.9 feet was made; on the south side the advance is through contorted schist seamed with limestone and veins of quartz. Water on the south side averages a flow of 179 gallons per second and the tunnel is given an iron lining in bad ground.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

JUNEAU.

Manager Pearce, of the Alaska-Perseverance mine, who represents the W. J. Sutherland interests at Juneau, has started work on the Greek group on Berner's river, next to the Jualin. The mine is being operated under bond from G. Kyrage of Juneau.

VALDEZ.

A. K. Beatson and A. Robertson of New York are reported to have sold the Big Bonanza group of copper mines on Latouche island, 80 miles from Valdez, to H. Gillette of New York and associates. The property is claimed to be a mountain of ore containing 9% to 30% copper.

ARIZONA.

COCHISE COUNTY.

N. H. A. Mason of San Francisco and associates have bought the Gold Farm group of mines, near Wilcox, from E. Braun and others. Development work has been commenced.

The old Terrible 10-stamp mill at Cochise has been taken down and removed to Manzora, to be operated in connection with the 20-stamp mill now under construction. In addition the 50-ton smelter is being pushed to completion.

COCONINO COUNTY.

A three-eighths interest in the Last Chance mine, in the Grand canyon, near Flagstaff, has been bought by R. Foster of Chicago, Ill., for $50,000. A large body of high-grade copper ore is said to be exposed in the developments.

GILA COUNTY.

F. W. Force, of the Bobtail Co.'s gold mine, near Globe, reports the mill as making a satisfactory run, and the mine is improving with development. It is, he states, the intention of the company to add to the battery of stamps, in order to work custom ores.

G. Lohb has bonded his mine, near Silver King, to A. C. Siehoth of Globe. It is a gold property, on which 2500 feet of development work has been done.

The Williams & Blake Ore Leaching Co. has been incorporated at Globe, capital $75,000, by J. Williams, J. Blake, G. A. Olney, P. Andarsen and Z. C. Prina. The company has an ore leaching plant already in operation.

GRAHAM COUNTY.

The Bueno Vista M. Co. of Solomonsville has been incorporated by J. S. Blake and associates, capital $1,000,000, to operate claims in the Lone Star district.

MARICOPA COUNTY.

The Leviathan G. M. Co., operating near Congress, D. M. Purman, manager, has decided to erect a 40-stamp mill, so as to have it in operation by Jan. 1st next.

MOHAVE COUNTY.

H. P. Ewing has bonded the Roosevelt group in the Boundary Cone country, near Kingman, and has let a contract to W. A. Brooks to sink a shaft 50 feet.

PIMA COUNTY.

B. Hamilton has located claims on a ledge showing native copper 30 miles southwest of Tucson.

SANTA CRUZ COUNTY.

At Washington, on the Pool mine, E. M. Ray manager, the ore body has been reached by the shaft.

W. Powers of Patagonia and E. Heck, owners of the Bland mine in the Tyndall district, are negotiating the sale of an interest in the property to a Mr. Barker of Los Angeles, Cal., to secure a concentrating plant.

A rich gold find is reported in a mine owned by W. Woods, G. Morris, A. Moody and C. Wilson of Nogales. It is reported to be a 10-foot ledge of free milling ore.

YAVAPAI COUNTY.

The Poland mill is producing twenty tons of concentrates daily, with twenty stamps in operation. Some gold values are secured on the plates also.

H. Simington has organized the Grand View M. & M. Co. to operate a group of five quartz claims in Cherry Creek district, near Prescott.

A rich strike is reported made on the properties of the Bigbug G. & C. Co., near Mayer, of which J. H. Canavan is manager. The shaft is down 180 feet, and is said to be all in high-grade sulphuret ore, carrying copper, gold and silver.

E. A. Franke has bonded the Golden Belt, Gold Standard, Mari and Mars claims, near Cordes, and has started development work on them. It is claimed that several hundred tons of float ore can be picked up that averages $15 per ton in free gold, besides lead and silver. A five-stamp mill, with concentrator, will be erected on the property at once.

The Lincoln M. & M. Co. is developing water for its mill. A tunnel is now being run 100 feet below the old water tunnel which supplies the present mill, which is also expected to cut the main ledge in 400 feet. The ore is free milling. The company is putting up a sawmill.

The extension of the Congress mine, at Congress, has been sold to O. F. Woodward, W. H. Hooker and associates of New York. A 130-foot incline shaft has been sunk, showing over 10 feet of ore in the bottom.

The Century Mines Co., in which E. M. Sanford of Prescott is interested, is sinking a double-compartment shaft on their property, near Kelly's station. The vein is reported to he 18 feet between walls, and the shaft entirely in ore.

YUMA COUNTY.

Engineers have begun the final survey for the dam to be built on Bill Williams Fork. It is proposed to build a dam 125 feet in height. From this reservoir the water will he conducted into the Plomosa desert, where have been found many rich placer gold deposits.

J. Roseborough of Denver, Colo., has bonded his Copper King mine, near Bill Williams fork, to Los Angeles, Cal., people. It is a low grade proposition, carrying 7% to 8% copper and some values in gold and silver.

CALIFORNIA.

AMADOR COUNTY.

The Amador & Calaveras Red. & M. Co. has been incorporated at Stockton, capital $200,000, with Directors T. A. Nelson, E. H. Cary, F. H. Cordway, N. W. Mahaffay and J. Marshall, to operate in Amador county.

At the Ballard & Martin mine, near Plymouth, Hayward & Lane, who have a bond on it, have commenced prospecting ledges which run through the property, testing them preparatory to sinking. Mr. Smart has charge of the work.

The Connelsville, Pa., people who recently bought the Ivanhoe mine at Plymouth of S. C. Wheeler, intend to open it up very shortly.

The vertical shaft on the F. Allyne Orr ground on Indian creek, near Plymouth, is now down 25 feet and requires a larger pump to handle the increasing water.

At the Hercules, at Plymouth, owned by C. H. Shields, three men are sinking on a lately discovered ledge that shows a good prospect in gold.

The plans for the erection of a new hoist at the east shaft of the Kennedy mine, at Sutter Creek, are under consideration by the directors. The construction of the hoist and the erection of the additional mill have been definitely decided upon.

The additional twenty stamps at the Central Eureka mine at Sutter Creek have been started. The mine has rock in sight sufficient to keep the forty stamps running constantly. W. R. Thomas is Supt.

CALAVERAS COUNTY.

At the Continental mine, near West Point, owned by Kline & Graves, a new 5-stamp mill will be erected. The millsite has been graded and building materials are on the property.

The Sultana Co., at Angels, will put up a new double hoist, capable of sinking their vertical shaft 1600 feet.

F. Cuneo, Jr., is erecting an arrastra on his quartz mine near Fricot. Considerable work has been done on the mine, a tunnel in 140 feet showing up a good vein.

It is reported that the Fort Wayne M. Co. will soon start up the Marshall gravel mine at San Andreas.

E. L. Burns and F. Treat, Jr., have bonded the Pajaro, Alpine, Clincher and Winchester claims, near Jesus Maria.

The old Duryea property on Central hill, near Jackson, recently bought by W. M. Nuner, Jr., and D. A. Nuner, is showing a good ledge between slate walls, with rich ore coming from kidneys and stringers. A shaft and tunnel are on the property.

EL DORADO COUNTY.

At the Columbia mine at Spanish Dry Diggings the shaft is down 40 feet in ore that prospects from $10 to $15 per ton. At the bottom of the shaft the ledge is from 4 to 5 feet wide. Mr. Holden is the Supt.

The Summit Hill mine at Spanish Dry Diggings has been sold to an Oakland company.

W. B. McKenney of Saoramento, one of the owners of the Stuckslager mine at Lotus, has started up mining in it.

The Mines Exploration & Development Co. of Los Angeles has bonded the Atlantic mine at Placerville and proposes to commence reopening the property at once.

INYO COUNTY.

What was known as the Millspaugh 2-stamp mill at Junction has been destroyed by fire.

KERN COUNTY.

The Josephine T. G. mine, near Randsburg, has been bought by J. P. Howe, A. Kane and R. T. Brackney, for $500, from J. Kelly and Price Bros. Kane & Brackney have bonded their interest to the Culbert Bros.

Supt. C. H. Wynn of the Baltic M. Co. says a new 10-stamp mill will be erected at once at the Baltic mine in the Stringer district, near Randshurg. The Baltic, mined in a small way, has produced in bullion about $40,000, and there are about 2000 linear feet of shafts and drifts opened. It is a large body of low-grade ore, with occasional shoots of rich ore, making an average that pays. The stamps will be of 850 pounds weight, and the engines will have a capacity of 40 H. P., the boilers using oil as fuel.

MONO COUNTY.

Work has been commenced on a cut to lower Lundy lake to provide water for irrigation and power uses and to recover the tailings from the Lundy quartz mills that are now submerged.

At the Sweetwater mine, near Bridgeport, the main crosscut tunnel is now in about 290 feet. It is expected that the east ledge will he reached in about 30 feet more, when an upraise will be made large enough to be used for letting timber down to the tunnel level. A track will be laid from mouth of tunnel to top of mill. J. J. Phelan of Bridgeport, Conn., is president of the company.

At the Golden Gate mine, Antelope valley, in grading a place to pile the ore that was being taken from the tunnel, a 3-foot ledge of milling ore has been discovered. The mill will be started about June 1.

NEVADA COUNTY.

W. W. Turney, Supt. of the mines of the Gold Deposit M. Co., below Montezuma hill, near Nevada City, reports that his company has started the tunnel to tap the Keiffer ledge at a depth of about 150 feet.

I. Haas and I. Stein have sold the control of the Alta California gravel mine to Haub Bros. of San Francisco and G. R. Tuttle of Grass Valley. The mine adjoins the Holbrook mine, about 2½ miles west of Grass Valley, and has been worked in a primitive way for the past fifteen years. Several shafts have been sunk at different points by the buyers, and they intend to open up and develop the mine on an extensive scale, installing machinery.

The New Hope quartz mine on Rock creek, near Nevada City, has been sold to F. Zeitler and J. J. Jackson by G. Johnston, S. Erskine and others.

The Syracuse & California M. Co., represented by A. H. Tickell, has made the first payment on the Culbertson mine, near Graniteville. The company is working the Culhertson and National group of mines, and when they are connected it is thought that fully thirty stamps can be kept running continually.

Mr. Priestly, who has been operating a dredger at Smartsville for some time, is going to construct a dredger for the purpose of working the bed of Deer creek, a few miles east of Smartsville.

Good ore has been uncovered in the winze which is being run from the Central mine shaft in the direction of the old workings of the North Star at Grass Valley.

At the North Star at Grass Valley it is reported that a rich find has been made in a lower drift and that further development work will he prosecuted.

PLACER COUNTY.

It is reported that a rich strike has been made in the Morning Star drift mine at Iowa Hill. The controlling interest in the property is now owned by Harold Power of Auburn.

SAN DIEGO COUNTY.

At the California Gold King mine, at Picacho, the railroad is nearly completed and the reduction works will he turned over to the company about July 1. The present payroll of the company is about $18,000 per month for 400 men. When completed, the company will have the largest cyanide plant in operation in the world. Its capacity will he 1800 tons per day. E. Gee, general manager, is at present in direct charge of the works.

A rich strike of free-milling gold ore is reported made on the old Government road running from Soda Springs to Manvel. The ledges are large and extensive and are in a formation of quartzite and porphyry. The ore is free milling and high grade.

The Nohles-Eureka group of claims, 65 miles northeast of San Diego, a free milling gold property, developed to some extent, and with a 5-stamp mill, has been sold to an English company for $3000. The pay shoot, it is stated, has been uncovered for 3000 feet and varies in width from 6 inches to 3 feet.

SHASTA COUNTY.

On the Shasta G. & C. Co.'s claims, between Pit river and Squaw creek, near Delamar, W. F. Mitchell, manager, has established a camp and started a tunnel under a capping of gossan. In this tunnel a rich ledge of black copper sulphides has been struck and crosscut 10 feet without disclosing the other wall of the ledge. The ore carries good values in silver.

A. Alexander, E. C. Allen, J. Drennan and W. Sweitzer, owners of the Tamarack mine, near Copper City, have struck the ledge in the tunnel 80 feet in from the entrance. The ore shows free gold values and indications of copper sulphides.

Supt. Sletcher of the Arps group of mines at Copper City has increased the force at work on the claims. It is reported that some fine gold-bearing rock has been taken out lately.

It is reported that the Bully Hill Co. has struck a very rich body of native copper in the mine at De Lamar.

Early Bros., at Shasta, at a depth of 50 feet have encountered a 9-foot ledge of free milling ore that assays an average of $62 a ton.

The Great Western G. Co. of St. Louis, Mo., has bought the Liberty group of mines in Flat Creek district. E. F. Adams is in charge of operations. A smelter is to be built near Copley. The group of mines consists of 900 acres, of which 640 are patented. Twenty-five men have been employed for some time under H. McCurry.

The Oro Fino mine on Clear creek, near Shasta, has been bonded to W. Moran, who has transferred the bond to the Sonoma G. M. & M. Co., who will start work at once prospecting the property.

The Niagara mine, near French Gulch, is to be reopened on an extensive scale after having been idle for several years. The Niagara-Summit M. Co. has been formed in New York, with W. T. St. Auburn, former manager, as president and general manager.

SIERRA COUNTY.

At the Last Chance mine, on the ridge between Forest City and Goodyear Bar, the main tunnel is being advanced by Miller Bros. and C. Scheffer.

J. M. Harper of San Francisco will shortly commence the extension of the tunnel into the Columbia gravel channel near American hill, above Forest City. This tunnel is already over 500 feet long.

Good progress is being made in the tunnel at the Bellevue mine at Gibsonville. It is now in about 3000 feet, one-half the distance in to pay gravel. About forty men are employed, and the tunnel is being advanced at an average rate of about 70 feet a week.

The King G. M. Co., which owns four quartz claims near Sierra City, has recently struck the ledge in the lower tunnel, where it is from 5 to 7 feet in thickness and of excellent grade.

SISKIYOU COUNTY.

G. W. Whip has bought the quartz mines on Cherry creek from J. Ironsides of Yreka, which the latter has been prospecting for several years. In the lower tunnel a 20-inch vein of ribbon quartz has been discovered, which, it is claimed, pays about $200 a ton. The tunnel is in about 75 feet and has yielded fifteen tons of ore. It is the intention of the new owner to put up a quartz mill at the head of Greenhorn creek.

Supt. Whitney of the Pine Grove placer at Oak Bar says the company will install an engine at the mine and pump water from Klamath river to operate the elevator with.

The miners along the Klamath river, in the Seiad Valley, Hamburg, Scott River and Happy Camp districts, are all busy with their giants and elevators, besides ground sluicing, while water is plentiful, and will take out considerable gold this season. Quartz ledges are being found in the Happy Camp section, which prospect rich.

The King Solomon mine, near Cecilville, has been closed down temporarily, owing to the breaking of the shaft of the mill engine.

The Consolidated M. & Dredging Co., at Callahans, have been operating the dredger about a month. The gold-saving device is pronounced the most satisfactory of any yet tested in that section. It is estimated that not more than half of 1% of the gold is lost in the tailings.

The Siskiyou M. & Dev. Association of Etna has taken a two years' bond on the coal vein near Ager, owned by A. Wise. A 3-foot vein has been developed in the bottom of a 50-foot shaft.

TUOLUMNE COUNTY.

P. Capella and partners have bonded the Bourbon mine, near Columbia, to H. C. Dodds of Oakland, who will immediately commence sinking a new shaft.

J. Oldman has discovered asbestos on his ranch, near Columbia. He is sinking on a ledge about a foot wide, being down nearly 14 feet. The mineral is green-grey in color and breaks in long slender fibers.

At the Woodside gravel mine on Table

Mt., near Springfield, tho incline shaft is down 150 feet and the face of tho workings is in gravol. A whim is used for hoisting. No water has yet heen struck.

Stanford & Estee, at Tahle Mt., on the Doyle ranch, near Sonora, have installed an 8 H. P. steam engine to run the hoist. Tbe sbaft is down 75 feet.

W. J. Wait, secretary of the Mack quartz mine, at Big Oak Flat, is making arrangements iooking toward the reorganization of the company and resumption of work at the mine.

J. M. Merrell of San Francisco has bonded until Jan. 15, 1903, the Cosmopolite quartz mine, near Groveland, at $10,000, from W. Pool, W. Schmidt, D. B. Gilliam and J. T. Poll.

S. Additon is at the Confidence mine, near Carters, making tests preparatory to putting in a cyanide plant, and has constructed a small sampling works to determine the character of the plant to be installed.

At the Sunnyside mine, at Carters, preparation is being made for operations on a large scale. A tramway is being bullt from the mine down to the river, where the mill will be located.

Work will be started up on the Bluebell mine, at Carters. The development work so far consists of a shaft 55 feet deep and a drift of 25 feet on the vein. The vein is 8 feet wide and the ore contains a high percentage of lead with free gold.

The New Aibany mine, at Carters, owned by Ballard & Martin, it is reported, is to he started up. When closed down on account of litigation, it is said it was very rich.

The Yellow Rock, a recently discovered mine on Knight's creek, near Columbia, owned by Lane & Martin, has been bonded to J. T. Newcomer. It has a vein from 10 inches to 2 feet in thickness and a mill test returned $25 to the ton. The property is being developed by a tunnel.

The Monterey Co., owner of the Longfellow mine at Big Oak Flat, has men at work cleaning the property and preparing to operate it on an extensive scale.

At the Two Brothers mine at Groveland, R. O'Brien, Supt., the gallows frame is up and the boller in place, and work will be resumed in the shaft, which has been enlarged and retimbered.

COLORADO.

CLEAR CREEK COUNTY.

A carioad of concentrates has been shipped from the '94 mill at Yankee, the first consignment out since it was completed. The '94 mill is using the Waugh dry concentration process.

The Santa Fe mine, near Idaho Springs, has 3 feet of pay ore opened in the second ievel at a depth of 200 feet. The company has plans on foot for extended work.

A. L. Preston and T. Brinkerhoff have bought the old stamp mill at Alice, are overhauling the machinery and will add new machinery, inciuding concentrating tables. They propose to make it a mill of forty tons capacity and will use both plates and concentration for the saving of values. Later they anticipate adding either a cyanide or chiorination plant.

About 110 feet were driven at the Empire tunnel at Empire in April in twenty-two rounds, making an average of 5 feet per round. Extremely hard rock kept the daily average down to 4 feet early in the month, later a change for the better made the average.

J. Frazer has leased the Robeson iode from Maxwell & Davis at Silver Piume and has made a strike of a solid high-grade ore shoot of from 5 to 8 feet width.

FREMONT COUNTY.

The Rocky Mountain Smelter Co. has closed down the piant at Florence in order that lead furnaces may be added and alterations necessary to make it a combination smelter, capable of treating all kinds of ores, may he made. Two or three months will probably be consumed in making these changes.

GILPIN COUNTY.

A company has been formed with a capital of $50,000 to build an independent sampling works at Black Hawk. The stockholders are largely local mine owners. It will be of 100 tons capacity, automatic throughout. Plans are being drawn and contracts will soon be let, as the company propose to have the works ready for business by the first of June. D. H. Allen is secretary and manager.

April shipments of ore and tailings from Black Hawk to the smelters and outside points of treatment were 405 cars, or 7495 tons, the biggest month's shipment in the history of the county, and an increase of 148 cars, or 2740 tons, over April, 1901, a gain of over 60%.

GUNNISON COUNTY.

J. T. Quigley, representing Galveston, Texas, people, has bought of Scott & Kimbush for $20,000 the Whig group of five claims near Pitkin. The workings consist of a tunnel and shafts, showing an ore shoot 56 feet in length and 4 feet wide, lying between walls of granite. The shoot will be developed hy a new 200-foot shaft.

HINSDALE COUNTY.

The Red Rover Co., operating near Lake City, D. A. Farrell, manager, has let a contract for a mill which at the start will have 100 tons capacity, arranged to be enlarged as necessity demands.

Contractors have begun work on the Tohasco power house, near Lake City, and the construction of the mill is to hegin in a short time. The building of the tram from the mine to the mill has also been started.

A contract has been let to J. Gavin to drive a tunnel on the I X L property at Lake City for the Texas owners.

Munro Bros. have bonded their gold hearing claim in Burrows Park to Lake City people for $10,000, and received a payment of $500 down.

A strike bas been made in the Lillie mine, on Henson creek, near Lake City, of a 2-foot vein of gray copper ore that mills $270 per ton. D. A. Farrell is manager.

LA PLATA COUNTY.

Prospectors in La Piata are giving attention to the Oro Fino section, with Lady Alice section west and Trimble section on the east. The three sections lie in a string between the Animas river and the backbone of the La Piata group of mountains. In the Trimble section the contact along the basaltic dikes, as far as exposed, is located, and surface work done shows materiai containing free gold.

OURAY COUNTY.

A rich strike of silver ore is reported from the Jonathan mine at Ouray. Assays give the ore a value of 300 ounces to the ton.

A strike has been reported in the tunnel of the Brooklyn mine, near Red mountain. A small streak of gold ore has been encountered in the breast of the tunnel which runs thousands of doliars to the ton. The main ore body is 12 feet wide and the average value across the entire width runs from four to six ounces in gold. The property is owned by Manion Bros. of Ouray.

SAN JUAN COUNTY.

W. H. Kearns of Silverton claims he has the extension of the recently discovered rich vein of the Isolde, or Inez-Hollister, of Burrows Park, Hinsdale county, in San Juan county. The vein in places stands out boid and bare, alongside of a well-traveled trail.

SAN MIGUEL COUNTY.

The 10-stamp mili of the Turkey creek group, near Telluride, has been destroyed hy fire, loss $15,000, with no insurance. W. H. Piper of Philadelphia, Pa., is the owner. A tunnel for the opening of the vein is now in 2500 feet, and the mill building has been utilized as a motor and converter house during its construction. Manager J. H. Shockley says the tunnel is nearly in to the vein, which will he cut at a depth of over a thousand feet, when it was expected to start the mill.

W. S. Buckley, manager of the Silver Bell and Butler mines at Ophir, is arranging for the construction of a new mill to be bullt at the mine this summer.

At the Alta mine in Gold King basin, near Telluride, it is the intention of the company to do considerabie development work this summer, and a canvas table plant will be constructed to treat the tailings after the pulp leaves the concentrators. A recent test made on a small table shows that the slimes in the tailings carry a high percentage of gold, silver and lead. The value determined was: Goid, 1.61 ounces, silver, 42 9 ounces, and 24.16% lead per ton. A. C. Koch expects to have a complete piant in operation before July 1.

A contract has been let hy the Japan Mines Co., at Telluride, to W. Treais and J. Lundstrom for the driving of a 3000-foot tunnel, and the work is now actively under way. Machine drills will be used and three shifts employed. The tunnel is in ahout 500 feet. The tunnel will drain the mine and greatly improve the facilities for creating an output.

TELLER COUNTY.

R. Bianchard, Supt. of the Bimetallic Tunnel Co., working on Copper mountain, has encountered a large vein of ore. A mili run is claimed to have given returns of $32 a ton. The tunnei is in 400 feet, where a winze 100 feet deep was sunk. From the hottom of the winze a crosscut, in 65 feet, has struck a vein known to be over 42 feet wide. The mill test was taken across this vein.

The Chamber of Commerce of Crippie Creek is to consider the matter of mine drainage of Cripple Creek district mines and to start definite action toward securing it. As planned hy the Chamher of Commerce, the money necessary to drive the hore is to be ohtained through a system of taxation, similar in operation to that prevalling in the irrigation districts of California. The estimated cost of the tunnel is $2,000,000 and the work would extend over a period of seven or eight years. The hore will out Bull hill at a depth of 3000 feet, and, if the work is carried forward through assessment, the individual amounts paid would he small, and in the case of the mining companies would be much iess eventually than the enormous monthly outlay for pumping machinery and its operation.

A production of twenty-five tons a day is being made from the Deerhorn mine at Cripple Creek, owned by W. S. Stratton, and the ore averages ahout one ounce to the ton. The ore is being mined from the 200 and 400-foot ievels of the mine from ground so soft that it permits of operations being carried on without much powder.

The production of Crippie Creek district by plants for April was as follows:

	Tons.	Average Value.	Gross Value.
Colorado City piants	24,000	$30	$720,000
Union	9,500	30	285,000
Metallic (tailings)	9,000	..	15,000
Economic	4,500	35	157,000
Smelters	11,000	60	660,000
Miscellaneous	....	..	20,000
Total	58,000		$1,857,000

The Addie C. claim, located adjoining the Laura Lee at Cripple Creek, has heen sold to J. K. Walch and J. H. Farrell, of Chicago, Ill., for $22,000, by the Addie C. M. Co. The claim has an area of ten and one-third acres. The greatest depth that has been obtained on the property is 235 feet, with about 100 feet of drifts and crosscuts. Weyand & McDaniels have a iease on the property, which has fifteen months to run yet.

There is said to be a strong probahility that a small concentrating plant will be erected at Crippie Creek hy W. Christen, who owns the Gush Pop ciaim, which has a vein that assays $5 to the ton in gold. He considers that with a concentration plant he can save enough to make it a paying proposition.

The sale of the Laura Lee ciaim, located on Minerai hill, Cripple Creek, for $50,000, $10,000 down, is announced. The property was sold by F. J. Campbeii and G. S. Wood to J. K. Waish and J. H. Farrell of Chicago, Ill., who iately hought the Addie C., an adjoining property, for $30,000.

J. Stoveken has contracted to sell to the Teller County M. & Ex. Co. the Gold Vaiiey placer at Crippie Creek, consisting of 127,823 acres.

With 300 feet advance a connection will he made from the Chicago-Crippie Creek tunnel with the Plymouth Rock shaft on Globe hill. The work is being done hy W. S. Stratton and the tunnel will cut the Plymouth Rock at the depth of 1000 feet. The tunnei, when completed, will be a mile in length and explores one portion of Gold hill and a portion of Globe hill.

IDAHO.

BOISE COUNTY.

A strike has heen made in the Lucky Boy mine, at Idado City, G. W. Thomas Supt., of ore averaging $20 a ton at a depth of 210 feet.

IDAHO COUNTY.

(Speciai Correspondence).—The spring weather is cold, making a iate start in spring water for mining. The Moose creek placers, C. P. Richardson manager, started piping on Aprll 17th with a half time water suppiy. The Newsome & Leggett Creek Placer M. Co. has heen enjoined from operation by parties who have iocated its dumps.

Newsome, April 29.

In starting a raise from the No. 1 ievel to the surface of the Jumho mine at Hump the miners encountered 4 feet of ore that has been miliing $180 free to the ton. It is claimed to he the richest ore ever struck in the camp, considering the quantity of it.

The Delta G. M. Co. has been incorporated at Wallace, capital $600,000, with directors C. S. Crysler, J. M. Savage, B. M. Crysler, H. E. Chaney and G. H. Keep. The company will put in a dredger on Beaver creek below Delta.

SHOSHONE COUNTY.

At the Cœur d'Aiene M. Co.'s plant, Manager Brown is moving the hydraulic elevator preparatory to starting the washing of gravel.

LEMHI COUNTY.

A 10-stamp mill is to he installed at the Kittie Burton mine, near Salmon City. R. L. Edwards is manager. The mill will be 3300 feet from the mine. An aerial tramway will connect the mine and mill, operating hy gravity. The new mill will be provided with hoth steam and water power piants.

F. C. Hagel, owner of the Riverside group of claims, on Salmon river, near Saimon City, reports a new strike of 4 feet of hrown hematite carrying $20 a ton in free milling gold.

MICHIGAN.

HOUGHTON COUNTY.

The Victoria C. Co. will commence at once on tbe construction of the quarter-mile railroad connecting the mine and the proposed millsite on the Ontonagon river. One head of stamps will be huilt this summer. It is planned to have two heads ultimately. The mill will differ from any other at the iake, as it will be operated by compressed air instead of steam. The ore road will probahly be operated by electricity to he generated by a water power. The compressors will also be run by electricity, making the Victoria independent of coal as fuel.

Rock breakers are now being installed in Nos. 1 and 3 rock houses at the Adventure mine, near Houghton. The rock will he conveyed from the Butler tunnel hy electric tram cars from the various iodes direct to the rock houses, without rehandling. By July 1, when the first head of stamps goes into commission, the Adventure will have 4 miles of underground openings, with three shafts in commission and the Butler tunnel opening up various iodes. The water tunnel which is now out 340 feet under Lake Superior will he extended to the full distance of 1400 feet, where it will strike 40 feet of water. The work is progressing at the rate of 160 feet per month.

The mining equipment and materiai of the Arcadian mine, near Houghton, is being taken from the abandoned Arcadian shaft, even to the brick.

MARQUETTE COUNTY.

The striking of a big vein of copper ore near Sanks Head is reported. It is claimed that the ore runs nearly 30% copper, with some gold and silver values. The vein is 17 feet wide.

MONTANA.

BEAVERHEAD COUNTY.

The Eriega Copper & Coal M. & S. Co., J. F. Firch of Butte, Pres., is pianning for a smelter to be placed on the mine at a cost of between $25,000 and $50,000. The company ciaims to own forty copper claims and several thousand acres of coal iands. In addition to the smelter the company will put in a sawmili, a number of buiidings, and possibiy an electric piant this summer.

CARBON COUNTY.

P. H. Gailagher, C. E., representing the Amalgamated Copper Co., has surveyed the Bear Creek coal fields near Red Lodge. It is helieved the Amalgamated is planning to buy these mines and consolidate them with the copper mines.

FERGUS COUNTY.

R. Hendry & Co. have bonded a group of claims near Kendall at $57,000, from A. Newman, A. Clark, F. A. Barnes, C. Young and P. Morris. A bond has also heen taken hy the same people on tbe Hugh Green group of cyanide ciaims, situated in the same district, at $5000.

LEWIS AND CLARKE COUNTY.

B. B. Kelly, E. E. Doty and C. Lindquist, of Helena, formed iast year the Combination M. Co., which has been working upon property near Austin and now have hetween 200 and 300 tons of ore on the dump, which has an average goid value of $7 per ton, in addition to $3 per ton which the smelter will pay for the ore as flux.

MADISON COUNTY.

J. M. King has bonded to W. M. Brown the U. S. Grant and Fairweather mines in the Fairweather district, near Virginia City, at $40,000, $500 cash down. Brown agrees to put a mill of forty tons capacity on the mine before January 1, 1903. The bond has heen assigned to G. A. Pratt of Minneapoiis, Minn.

Reports from Sand creek say that the country has been staked 10 miles on tbe contact from the Whippoorwill mine. It is claimed that the ore is sylvanite in a 5-foot vein hetween limestone and schist. Assays run from $56 a ton upward

W. A. Lord, O. Huffman and E. Mahoney have leased the Mountain Cliff mine at Pony.

SILVER BOW COUNTY.

Gemmell Bros. have struck ore in the Gemmell ciaim, near Butte, in a vein 2½ feet wide at the point at which the tunnel, hy which the ground is heing opened up, cut it. The ore carries, in gold, silver, copper and lead, a value of more than $100 per ton—12% copper, fifty-two ounces of silver per ton, some lead and $4 50 in gold.

NEVADA.

ESMERALDA COUNTY.

A gold strike is reported in the Silver Peak mines—the property of the Blairs of New Jersey—south of Candelaria. The

men at work under the direction of S. Wasson, in following a small stringer, came upon a pocket of coarse gold. It is claimed that more than $100,000 has been taken out.

HUMBOLDT COUNTY.

The Hardesty mine in Relief district has been sold to San Francisco people.

LINCOLN COUNTY.

E. A. Higginson of Spokane, Wash., has bonded the Mendha mine, near Pioche, from T. J. Osborne, J. Cook and W. Lloyd, and the Gold Eagle and Gelder mines adjoining from H. Weiland and J. Bingham.

LYON COUNTY.

Beck, Wright & Allson are doing work on the Taylor mine, near Wellington, and have rigged up an arrastra to mill the ore. The ledge in the mine is small, but some of the ore, it is claimed, will go over $100 per ton.

NYE COUNTY.

The old Liberty mining district, which was prospected and worked in the early '60s, located adjacent to the Tonopah district, has lately been relocated and extensive developments are projected on the Burbanks (old Liberty), Florence and Sheridan claims. The principal development work in this district has been done on the Liberty claim. These claims have been recently bonded and new companies organized.

The Fraction mine, at Tonopah, is having a gasoline hoist installed in place of the whim now in use. The vein of high-grade ore in the north crosscut is still widening, about a foot of ore being broken and raised to the surface daily. A shipment of ore has been prepared and the first carload of ore started to the smelters.

NEW MEXICO.

GRANT COUNTY.

The General Turquoise Co., operating near Burros, has increased its force and regular shipments are being made.

A 10-stamp mill will be erected at Gold gulch soon by H. Finch, who recently bought the A. Hamilton mine. The ore is now being tested to determine the best method of treatment.

Assays from the Gold Hill, near Lordsburg, show values of $125 per ton in gold, silver and copper.

It is reported that $100,000 will be used by Eastern people for the buying of ore as soon as the new Silver City smelter is built. Also a refinery will be erected.

A proposition is now under consideration to erect a plant at Hanover for the reduction of low-grade zinc ores owned by the Mineral Point Zinc Co. The concentrates will be shipped to the smelter at Mineral Point, Wis.

D. C. Kling, Supt. of the Empire Copper Co., is doing extensive work on the Clearwater group at Silver City. Three shafts have been sunk. In the workings native copper has been encountered at a depth of 20 feet.

The Silver Cell mine, near Pinos Altos, has been sold by Dimmick Bros. to H. Finch and associates of St. Louis, Mo., for, it is reported, $100,000. The sale includes the mill and smelter, built by Dimmick Bros. Both will be operated by the new owners.

LINCOLN COUNTY.

W. A. McIver has sold the Vera Cruz group of mines near Nogal for $50,000 to Chicago people. It is a low grade free milling gold proposition. The new company will erect a large cyanide plant at the mine to treat the ores.

S. S. Doak, manager of the Iowa & New Mexico M. & M. Co., says the tunnel is now in 350 feet and has cut an ore body 20 feet thick which runs as high as $19.50 in gold. When completed, the tunnel will be 2000 feet under the surface.

RIO ARRIBA COUNTY.

J. P. Rinker, Supt. of the Danbury mine at Bromide, is placing a steam hoisting plant on it. The Payroll shaft will be sunk another 100 feet.——The St. Michael's and New Mexican copper properties have consolidated and their Gold Pan shaft is now in fine ore.

The Glen-Woody M. & M. Co. has been incorporated at La Crosse, Wis., capital $1,800,000, with the New Mexico office at Rinconado and W. M. Woody the New Mexico agent.

TAOS COUNTY.

G. B. Paxton and Pittsburg, Pa., people have bonded the Anaconda mine at Red River. Three shafts have been sunk. One, 420 feet deep, has developed a lead of quartzite and porphyry that averages $3.10 in gold. Mr. Paxton says that the ore can be treated by the cyanide process for 50 cents a ton.

OREGON.

BAKER COUNTY.

(Special Correspondence).—L. C. Jaquish, president of the American D. & M. Co. of Chicago., Ill., has started work on the Blue Canyon placers, near Auburn. They are on an old river channel that was worked in the early 60s very profitably.

The Phœnix M. Co. has resumed work at its mine near Sumpter. C. Parker is Supt.

An electric plant has been installed at the Prairie Diggings mine at Prairie. The present capacity of twenty-five stamps is to be doubled this season.

During April the Bonanza mine produced $54,760, exclusive of concentrates. The new hoist is completed and the work of sinking resumed. The shaft is 500 feet and will be sunk to the 2500-foot level.

A 300-foot tunnel has been completed at the Brooks property, adjoining the Ibex mine, near Sumpter. They will resume work as soon as supplies can be hauled in.

Sumpter, May 1.

Should the ores uncovered in the tunnel of the Baby McKee mine at Cable Cove prove of commercial value, a plant to treat them will be installed. It is also proposed to commence sinking on the Last Chance mine. O. Townsend is manager.

It is reported that the Cornucopia mine, owned by J. E. Searles of New York, has been sold by him to R. A. Aiger of Detroit, Mich., and associates. In connection with the buying of the mine is a proposition to build a railroad from Baker City to Cornucopia to facilitate transportation of the ores.

On the Golden Wizard property, near Sumpter, a new hoist, capable of sinking to a depth of 300 feet, has been installed. Manager McPhee expects to have ore enough blocked out by the end of the summer to justify the erection of a treating plant and to put in a larger hoist.

GRANT COUNTY.

G. J. Barrett, manager of the Big Four and Grand Union groups, near Granite, states that he has cut the main ledge 13 feet wide on the Big Four in a 400-foot tunnel.

JACKSON COUNTY.

The Last Chance G. M. & M. Co. of Ashland has elected R. P. Nell president, D. A. Applegate secretary-treasurer and O. C. Tiffany Supt. The company owns the Last Chance gold quartz mine and extension, near Gold Hill.

A. M. Williams of Los Angeles, Cal., has bonded the Indian Girl mine, near Ashland, from Booth & Burleson for $20,000, and has had ten men developing the property under I. C. Burleson, foreman. He is installing a 10-stamp mill.

LANE COUNTY.

A rich strike is reported in the Treasure mine owned by C. H. Park, in Blue River district, near Eugene. The ledge is said to be from 18 to 25 feet wide.

SOUTH DAKOTA.

OUSTER COUNTY.

The North Star M. Co. expects to have ten stamps running on its property near Custer City by July 1. The mill building is practically completed and is large enough for thirty stamps. It is the intention to adopt some tailing-treatment process, probably cyanide. The ore is said to average about $10 gold to the ton, $4 or $5 of this being free-milling and the rest refractory.

The Penobscot M. Co. has commenced work at the May & Johnson mine, in Garden City, with E. Manion as Supt. The old machinery at the mine is to be replaced and an air compressor and air drills installed.

LAWRENCE COUNTY.

The Spearfish G. M. Co., at Ragged Top, from the first cleanup of the new mill built to replace the one destroyed by fire early in January, has $14,000 gold. This is the April production. The mill lost considerable time during the month in order to readjust the plant which is perfectly new. Only eighteen tanks were handled out of a possible sixty. The mill is equipped with ten cyaniding tanks and the process is so adapted that these can be filled and emptied six times every thirty days.

PENNINGTON COUNTY.

The Cumberland M. Co. is doing development work on the J. R. mine, near Hill City. A hoisting plant has been installed.

UTAH.

BEAVER COUNTY.

The Majestic Co. has marketed sixteen carloads of ore from its mines at Milford. Thirteen from the O. K. mine contained 40.65% copper, $2.25 gold and 7.75 ounces in silver to the ton, and three cars were high grade silver-lead ores from the Harrington-Hickory mine. The copper ore, it is said, brought in the neighborhood of $65 a ton, the shipment being sent east of the Missouri river for treatment. The O. K. mine is said to be in excellent physical condition with large bodies of high and low grade ore in sight, and it is stated that it is the intention to begin at once the erection of a smelter for the treatment of the low grade product of the mine, and to make other improvements.

BOX ELDER COUNTY.

The Gibraltar C. M. Co. has been incorporated, capital $25,000, with W. E. Weihe president and W. D. Mathis secretary and treasurer. The company owns a group of thirteen claims in the Newfoundland district.

EMORY COUNTY.

The Hecker M. Co. property consists of a group of five claims near Woodside and is being developed under H. Hardy, Supt. Two shafts have been sunk and crosscuts run across the vein 40 feet wide, assays yielding from 30% to 62% lead, 4% copper and 68 to 238 ounces silver to the ton.

JUAB COUNTY.

Forty-five tons of ore from the Utah M. Co. mine at Fish Springs sold for $3143, the lot containing 62% lead and 93 ounces silver, with a little gold per ton, going to one of the Eastern smelters, the latter paying $17.50 per ton for transportation, and giving more for the ore than is to be had from local smelters.

SALT LAKE COUNTY.

Plans for the projected concentrator for the milling ore in the Bingham Con.'s Dalton & Lark group at Bingham have been completed by J. B. Fleming, the company's mechanical engineer. Supt. Fleming says it will be completed within four months after starting construction. The plans show a number of new devices designed specially in addition to the best features of plants now in operation. The plans as completed provide for a half dozen Wilfley tables, a dozen jigs, five sets of rolls, screens, sizing machinery and filter presses for the treatment of the slimes.

The Boston Con. Co., of Bingham, is adding to its equipment and is grading for a new compressor plant with a battery of three boilers to supply a dozen additional drills.

Two of the converters of the Bingham Con. smelter have been started up, beginning the production of copper bullion, carrying gold and silver. With all the furnaces and the two converters in operation, the product will be over a carload of bullion daily.

SUMMIT COUNTY.

The Belmont M. Co. has been incorporated at Salt Lake City, capital $300,000. J. R. Walker is president and E. McGurrin secretary and treasurer. The company owns the O'Donovan group, in Uintah mining district.

J. H. Conrad has bonded the J. J. C. group of five claims, near Park City, at $200,000 for eighteen months from W. H. Dodge, J. R. Clawson, M. McGrath, A. V. Taylor, F. W. Clawson and the Tufts estate.

TOOELE COUNTY.

The Hercules mine at Stockton, of the Cygnet M. Co., has been bought by C. H. Scheu of Salt Lake City. The retiring owners have made their output from levels above the 200.

The Con. Mercur mill during April treated 29,400 tons ore. The mill at Manning has been running on tailings. The Electric mill level tunnel has reached the 450-foot station from the main opening.

WASHINGTON.

FERRY COUNTY.

Manager E. J. Deibridge of the California mine is constructing a 6-mile wagon road from the mine and ore bins of 300 tons capacity on the Washington & Great Northern road at San Poil lake.

KITTITAS COUNTY.

The Elizabeth Gold Hill M. Co. of Yakima, have started work on their claims at the headwaters of the Natchez river. The company will sink a shaft and put in reduction machinery. The ore is said to carry $15.80 in gold, $28.02 in silver and $2.46 in copper, with a trace of lead.

OKANOGAN COUNTY.

The Clackamas G. M. Co. of Wauconda has resumed work on the tunnel. J. B. Chapman is president, C. E. Lawson secretary, J. C. Kerley general manager and W. C. Malott Supt.

PIEROE COUNTY.

The Consolidated G. Co. has been incorporated at Tacoma for the purpose of economically working many mines consolidated under one management. The capital is $15,000,000. S. R. Balkwill of Tacoma is president and L. F. McConihe of Tacoma secretary of the corporation. Eight groups of properties are comprised in the consolidation, including the Saw Pit Flat group in Pumas Co., Cal., twelve claims in the Mount Baker district, Skagit county, five claims in the Swauk district, Kittitas county, and many claims in Montana, Idaho, Oregon and Alaska.

STEVENS COUNTY.

The Blue Point Marble Co. of Spokane is building a wagon road from Addy to the quarry, and arrangements are being made to commence opening up the ledge. It is expected that machinery will be installed during this summer.

FOREIGN.

BRITISH COLUMBIA.

Out of an old channel on Lightning creek, in Carlboo, S. Montgomery has lately taken out in one day 100 ounces of gold worth $1875.

T. R. Lane of London, England, has bonded the Wakefield mine, near Silverton, for the Anglo-Slocan Syndicate, Ltd., and operations have been commenced under C. A. Sandiford superintendent and consulting engineer and W. McDonald foreman.

S. Norman, Western manager of the Ohio Northwestern Development Co., says his company has bonded the Black Prince mine, near Slocan City, for two years at $65,000, from J. Elliot of Nelson, W. E. Bore of Kaslo and C. Murphy, P. M. Schonberg, Dorin Bros. and others of Slocan City.

The Crofton smelter, on Vancouver Island, near Victoria, is expected to be ready about July 1. There are now about 250 men at work. It will smelt the ore from the Leonora mine. A new strike in the Leonora recently has, it is claimed, increased the ore tonnage of the mine about 30%.

It is reported that the Tyee M. Co. at Ladysmith will put in a 100-ton smelter in the near future.

The balance sheet of the St. Eugene M. Co., at Moyie, for the year ending Sept. 30, 1901, shows assets valued at $3,631,880, including a cash balance of $109,834, and stores on hand of $27,168. The mines are valued at $3,200,000 and the machinery and equipment at $150,004. After paying during the year two dividends, aggregating $210,000, and writing off $20,019 for depreciation, a balance of $125,359 is carried forward to profit and loss. Concentrates produced were 11,000 tons, which were shipped to Antwerp, Belgium. Development work blocked out over 200,000 tons of ore. A shaft was sunk to a depth of 60 feet below the level of Moyle lake, but there has been no inflow of water.

A consolidation of the Dominion Copper Co. and the Snowshoe gold-copper mines, Ltd., at Phœnix is projected. The control in the former corporation is held by R. Jaffray and Mackenzie & Mann of Toronto, and J. Breen of Spokane is a large owner. The Snowshoe group, a mile distant, is on a shipping basis, and the owners say it could easily ship 600 tons daily. Aside from the underground workings, the ore can be quarried from huge open cuts on the surface. The control of this company is held by the British Columbia (Rossland and Slocan) syndicate, A. J. McMillan of Rossland as managing director. If an amalgamation of the two companies is effected a smelter for the treatment of the ore of both mines will be erected at some point in the Kettle River valley.

G. W. Hull, manager of the Sullivan S. Co., says that at the Sullivan mine a shaft will be sunk to the 125-foot level and connected with the old workings, where there are now 265,000 tons of ore blocked out ready for shipment to the smelter. The smelter at Marysville is to start up about July 1. Work on the railway spur to the mine has been started.

The surface tramway from the portal of the main shaft of the Queen mine to the Yellowstone company's 10-stamp mill at Salmo has been completed and the mill started on the ore from the Queen. The Queen is under bond to P. McL. Forin, A. Cameron, G. Hopkins and M. Holmes of Nelson at $50,000.

The Mound and Copper Cliff claims on Copper mountain, in the Similkameen, are reported sold to the Standard Oil Co. by W. Y. Williams, O. Johnson and L. Jacobson for $52,000.

MEXICO.

Near Soyopa, Sonora, the Chicago G. M. Co., R. C. Coy president, is reported as operating its mill and projecting the construction of a larger plant, the ore producing capacity of the mine requiring it.

The Refugio group of copper mines, near Cananea, Sonora, owned by M. Latz of Magdalena and his associates, is being prepared for development work upon an extensive scale.

The Minnesota & Mexico M. & Dev. Co. are starting development work upon copper properties with great surface showings located near Matape, Sonora. The company has 1300 pertenencias of copper-bearing lands. M. P. Wright is Supt.

The Carlotta G. M. Co. has been incorporated to operate the Calera district, near Magdalena, Sonora. R. C. Bogy of Denver, Colo., is president and E. E. Quentin of Denver, Colo., is secretary and treasurer.

Personal.

J. B. FARISH of Denver, Colo., is in San Francisco.

J. W. PROUT of Denver, Colo, is at Globe, Ariz.

W. A. FARISH of Denver, Colo., is at Milford Utah.

J. W. ABBOTT of Donver, Colo., is in San Francisco.

M. LINDLEY of Fruitvale, Cal., is at De Lamar, Cal.

S. A. KNAPP of Hawthorne, Nev., is in Virginia City, Nev.

E. C. VOORHIES of Sutter Creek, Cal., is in San Francisco.

H. C. BELLINOER of Crofton, B. C., is at Greenwood, B. C.

H. M. CHANCE of Philadelphia, Pa., is in San Francisco, Cal.

S. S. TERRILL of Sumpter, Or., is in Salt Lake City, Utah.

H. L. HOLLISTER of Hailey, Idaho, is in Salt Lake City, Utah.

F. H. PROBERT of Los Angeles, Cal., is in Salt Lake City, Utah.

G. W. SMALL has returned to Salt Lake City, Utah, from Mexico.

E. I. FIELD of Telluride, Colo., is in Montana examining mines.

R. McF. DOBLE has returned to San Francisco, Cal., from Mexico.

W. J. WAIT of the Mack mine at Big Oak Flat, Cal., is in New York.

G. A. WANOER of Kingman, Ariz., has gone to Dawson, Yukon Territory.

J. S. HEDOES of Republic, Wash., is in Thunder Mountain district, Idaho.

N. H. GETCHELL of Tonopah, Nev., was in Silver City, Idaho, last week.

C. PARKER, Supt. of the Phœnix mine, near Sumpter, Or., is in New York.

G. D. B. TURNER of Butte, Mont., is examining mines at Bingham, Utah.

J. D. SWORD of Toronto, Canada, is examining mines near Jesus Maria, Cal.

S. J. CADY, Supt. of the Wolverine mine at Park City, Utah, has resigned.

T. MCSORLEY, Supt. of the Sunrise mine at Railroad Flat, Cal., has resigned.

G. A. PRATT has returned from Virginia City, Mont., to Minneapolis, Minn.

D. M. PURMAN, manager Leviathan G. M. Co. at Congress, Ariz, is in New York.

F. R. BYRNS, manager of the Penobscot M. Co. at Garden City, S. D., is in Chicago, Ill.

H. J. DUBOIS of New York is making a trip through the mother lode region in California.

J. HOOPER has heen appointed mine foreman at the Mammoth mine at Central City, Colo.

C. H. DUNTON has heen appointed Supt. of the Eureka slate quarry at Placerville, Cal.

D. H. ALLEN has been appointed manager of a new sampling mill at Black Hawk, Colo.

R. WALLACE has been appointed mine Supt. of the Independence Con. M. Co. at Victor, Colo.

U. CURTIS, formerly of Johanneshurg, Cal., is Supt. of the Fraction mine at Tonopah, Nev.

G. V. NORTHEY, Supt. Manzanita quicksilver mine at Sulphur Creek, Cal., is in San Francisco.

H. K. MASTERS of New York is Supt. of the Unlted States Co. smelter at Bingham Junction, Colo.

J. CUSICK of Deadwood, S. D., has been appointed Supt. of the Cape Nome Hy. M. Co. at Nome, Alaska.

O. C. TIFFANY has been appointed Supt. of the Last Chance G. M. & M. Co., operating at Gold Hill, Or.

J. W. CHENHALL, E. M., of London, England, is ln Denver, Colo., en route from Australia home.

P. G. DAWSON, Supt. of the Meguntlcook mine at Lake City, Colo., has returned from New York.

E. W. DAVIES of Central City, Colo., has been appointed manager of the Charter Oak mine at that place.

W. F. SNYDER of Salt Lake City, Utah, has been appointed manager of the Honerine mine at Stockton, Utah.

M. BRADLEY of Prescott, Ariz., has heen appointed mine foreman for the Lion G. M. Co., operating near that place.

O. TOWNSEND of Cripple Creek, Colo., has heen appointed manager of the McKee and Last Chance mines at Cable Cove, Baker county, Or.

G. L. HOLMES, E. M., of the Link Belt Machlnery Co. of Chicago, Ill., is ln San Francisco en route on a trip through the gold dredger mining districts of the Pacific coast.

Latest Market Reports.

SAN FRANCISCO, May 7, 1902.

METALS.

SILVER.—Per oz., Troy: London, 23d$\frac{13}{16}$ (standard ounce, 925 fine); New York, bar sllver. 51$\frac{5}{8}$c, refined (1000 fine); San Francisco, 51$\frac{5}{8}$c; Mexican dollars, 44$\frac{1}{2}$c San Francisco, 41$\frac{1}{4}$c New York.

COPPER. — New York: Standard, $11.00@11.15; Lake, 1 to 3 casks, $12.10; carload lots, 11.87\frac{1}{2}$; Electrolytlc, 1 to 3 casks, $12.00; carload lots, $11.75; Casting, 1 to 3 casks, $12.75; carload lots, $11.50. San Francisco: $14.00. Mill copper plates, $17.00; bars, 18@24c. London: £53 5s per ton.

LEAD.—New York, 4.12\frac{1}{2}$; Salt Lake City, $3.60; St. Louls, $4.00; San Francisco $4.50, carload lots; 4$\frac{1}{2}$o 1000 to 4000 lbs.; pipe 5$\frac{1}{2}$, sheet 6, bar 5$\frac{1}{2}$c; pig, $4.75. London, £11 12s 6d per ton.

SPELTER. — New York, 4.42\frac{1}{2}$; St. Louis, $4.00; London, £18 2s 6d per ton; San Francisco, ton lots, 5$\frac{1}{2}$c; 100-lh lots, 5$\frac{3}{4}$c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8$\frac{1}{2}$c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN. — New York, plg, $28.25; San Francisco, ton lots, 30c; 1000 lbs., 30$\frac{1}{2}$o; 500 lbs., 30$\frac{1}{2}$c; 200 lbs., 30$\frac{1}{2}$c; less, 31c; bar tin, ℔, 35c.

PLATINUM.—San Francisco, orude, $17 ℔ oz.; New York, $18 per Troy oz.

QUICKSILVER. — New York, $50.00 large lots; London, £8 15s; San Francisco, local, $47.50 ℔ flask of 76$\frac{1}{2}$ lbs.; Denver, $51.00. Export, $45.00.

BABBITT METAL.—San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure lngots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.30c; San Francisco, Plumbers', 100-lb. lots, 16c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer plg, $17.25; gray forge, $17.75; San Francisco, bar, 2.75 ℔ lb .,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $31.75; open hearth billets, $32.25; San Francisco, har, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per bbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19.50; extra sizes hlgher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19.00; shlngles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No. 1. 70% nitro-glycerine, per lb., ln carload lots, 15$\frac{1}{2}$c; less than one ton, 17$\frac{1}{2}$c. No. 1*, 60%, carload lots, 13$\frac{1}{2}$c; less than one toss 15$\frac{1}{2}$c. No. 1** 50%, carload lots, 11$\frac{1}{2}$c; led, than one ton, 13$\frac{1}{2}$c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9$\frac{1}{2}$c; less than one ton, 11$\frac{1}{2}$c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blastlng powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Trlple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in hulk, $17 in sacks; Sunnyside, $11 75, long ton.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2$\frac{1}{2}$@3c ℔ lb.; blue vitrlol, 5$\frac{1}{2}$@6$\frac{1}{2}$c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2$\frac{1}{2}$@ 2$\frac{1}{2}$c; California refined, 1$\frac{1}{4}$@2c; nitric acid, ln carboys, 8c ℔ lb.; caustic soda, in drums, 3@4o ℔ lb.; Cal. s. soda, bhls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c: caustio potash, 10o in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 76c; cs., 81c; raw, bbl., 74c; cs., 79c; lots of 5 hhls., 1c less; Lucol oil, boiled, hbl., 66c; cs, 71c; raw, hhl., 64c; cs, 69c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13$\frac{1}{2}$c; Mineral Seal, lron hbls., 19c; wooden hhls., 22$\frac{1}{2}$c; cs, 25c; Mineral Sperm, cs, 26$\frac{1}{2}$c; Deodorized Stove Gasoline, bulk, 15$\frac{1}{2}$c; do., cs., 21$\frac{1}{2}$c; 86° Gasoline, bulk, 20c; do., cs., 26$\frac{1}{2}$c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 20$\frac{1}{2}$c; Lard Oil, No. 1 bbl., 60c: cs., 65c; Neatsfoot Oil, bbl., 70c; cs., 72$\frac{1}{2}$c; No. 1 bhl., 52$\frac{1}{2}$@55c; cs., 57$\frac{1}{2}$@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6$\frac{3}{4}$c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb, 7$\frac{1}{4}$o; less than 500 lbs., per lb., 7$\frac{1}{2}$c; in 25-lb. tin pails, $\frac{1}{2}$c per lb. ahove keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2$\frac{1}{2}$c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6$\frac{3}{4}$c; do. in kegs, 7$\frac{1}{2}$c.

ASSAY LITHARGE.—Per lb., 9c.

BISMUTH.—Subnitrate, per lb., $1.60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c; calcined, 20c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2$\frac{1}{2}$ lbs.

PHOSPHORUS. — (American) ℔ lb, 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb, 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. h. San Francisco, unless otherwise noted.)

Obituary.

HOWARD VAN FLEET FURMAN, one of the best known metallurgists, chemists and mining engineers in the Unlted States, and a recognized authority on smelting, died of pneumonia on April 28, ln Mapimi, State of Durango, Mexico, aged 45 years. He graduated from the School of Mines of Columbia College, New York, in 1881, with honors, and went to Colorado in 1882. As a metallurgist he built a reputation while employed as chemist by the Globe S. & R. Co. in Denver. Between the years 1882 and 1888 he was successively assayer, chemist and foreman of the Germania Lead Works in Utah, assistant superintendent of the Billings smelter, Socorro, N. M., and superintendent of the Bailey smelter, Denver, Colo. From 1894 to 1895 he was chlef assayer at the United States mint at Denver. In the fall of 1895 and until the spring of 1897 he was professor of metallurgy at the Colorado School of Mines. He was a man highly valued professionally and by a wide circle of friends, from which, cut down ln the prime of his life, he will be missed.

Commercial Paragraphs.

THE Raymond Bros. Impact Pulverizer Co. have moved their Chicago, Ill., offices to 738 Monadnock building.

SPON & CHAMBERLAIN, publishers of engineering books, after fifteen years' location at 12 Cortlandt St., have removed to 123 Liberty St., New York, N. Y.

GEORGE W. MYERS has been appointed Pacific coast representative of the Chrome Steel Works of Brooklyn, N. Y. His office is at 417 Hayward building, San Francisco, Cal.

THE Fred. M. Prescott Steam Pump Co. are now located at their fine new manufacturing plant at West Allis, Milwaukee, Wis. The new huildings cover several acres of ground and are equipped with the latest machinery.

THE British Westinghouse Electric & Manufacturing Co. of Manchester, England, has taken the contract to install Westinghouse steam turhines in the electric generating station to he huilt for the Metropolitan Railway Co. of London, and is now filling a similar contract for the Metropolitan District Electric Traction Co. of London. Arrangements are to he made for connecting the two and making them interchangeahle, as far as the supply of current is concerned, thls feature heing required by the franchises of the two roads. The Metropolitan power station will be located at Neasden ln the northwest of London, and will contain three sets of 3500 kilowatts capacity each. The Chelsea station of the Metropolitan District Railway will contain four sets of 5000 kilowatts each. The current will be three-phase alternating and of 10,000 volts. to be transformed in sub-stations to direct current for use in the car motors.

Recently Declared Mining Dividends.

	Payable.
Con. Mercur G. M. Co., Utah, monthly, 3 cents per share, $30,000	May 9
New York & Honduras Rosario M. Co., monthly, 1%	April 30
Calumet & Hecla M. Co., Mich., quarterly, $5 per share, $500,000.	May 20
Town Topics G. M. Co., Colo., No. 5, $\frac{1}{2}$ cent per share, $5000	May 1

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of tho following U. S. patents issuod to Pacific coast inventors:

FOR WEEK ENDINO APRIL 29, 1902

898,900.—ROCK DRILL CLAMP—F. R. Brown, Unga, Alaska.
898,814.—DOUGH MANIPULATOR—Chase & Rickey, S. F
898,915.—CULTIVATOR—W. C. Evants, Antioch, Cal.
898 699.—TRACTION DEVICE—F. L. Gould, Seattle, Wash.
898,701.—CAN CAPPER—H. L. Guenther, Chinook, Wash.
899,108.—EXTRACTION OF PRECIOUS METALS—B. Hunt, S. F.
898,706.—WRENCH—E. Huntley, Seattle, Wash.
898,718.—NIPPLE CHUCK—W. G Leas, Seattle, Wash.
898,530.—VALVE—F. H Mason, Spokane, Wash.
898,847.—TAPPET—McDonald & Tregoning, Grass Valley, Cal.
898,553.—INJECTOR W. Plotts, Whittier, Cal.
899,011.—MANUFACTURE OF SULPHURIC ACID—W. R. Quinan, Pinole, Cal.
898,737.—CONCENTRATOR—M. D. Rochford, Kingman, Ariz.
898,740.—CAR COUPLING—R. H. Rutherford, Marion, Or.
898,742.—SASH LOCK—W. Scharnweher, Seattle, Wash.
898,750.—LOO TURNER—J. J. Skinner, Paso Robles, Cal.
898,5*8.—CULTIVATOR—J. H. Thompson, Edna, Cal.
898,789.—WINDOW OPENER—J. M. Thorp, Alameda, Cal.
898,784.—PRUNINO SAW—Geo. R. Tyler, Pomona, Cal.
899,053.—OIL BURNER—R. Witty, San Bernardino, Cal.

SITUATIONS WANTED.

CHEMIST AND ASSAYER, WITH TWENTY years' experience in mill and smelter work. Can run same. Address A. C., care of Mining and Scientific Press.

Thoroughly experienced and reliable Chemist, Assayer and Millman open for engagement. Ten years' Western States, Canada and Central American experience. Address "Orland," care of Mining and Scientific Press.

MININO ENGINEER AND METALLURGIST, with twenty years' practical experience, desires position as superintendent of mine or smelter, or as consulting engineer to company. Best references. Address M. M., care this office.

OPEN FOR A PROPOSITION TO PROSPECT, east, west, north or south. Thoroughly understands mining, also mining laws. Have a good prospecting outfit. Address R. H. J., oaro of Mining and Scientifio Press.

WANTED.—Position as Foreman or Superintendent of quartz proposition or developed mine. Timbering and air machine drills a specialty. Sixteen years' experience. No fake references furnished. Correspondence soiicited. Present position not desirable. Address T. J. P., care of Mining and Scientific Press.

CHEMIST AND ASSAYER, with experience in mining, at present employed with large copper and lead smelting company in Mexico, seeks position as chief chemist or assistant superintendent. Has practical furnace work experience Address "Furnace," care of Mining and Scientific Press.

WANTED.—By a young School of Mines graduate, a position with reliable mining company as assayer, chemist and surveyor. Considerable surveying practice, besides one season with U. S. Geo. Survey. Can handle both and more. if necessary, for small company. State salary Have had practical mining experience. Good references. Address "Worker," care of this office.

WANTED.—Position hy an exrerienced and reliable assayer of all metals, and Bookkeeper. Has also had five years' experience in general merchandise business. Will give references from one of the best gold-producing quartz mines in California. Wire or write E. C. M. W, care of Mining and Scientific Press.

MINING ENGINEER, practical miner and mill man, assayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best references. Now working in southern California. Address A. M. P., care of Mining and Scientific Press.

WANTED.—SITUATION AFTER MARCH 15, 1903, as Manager or Superintendent of mine. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work Four years' experience as manager and superintendent. Treatment of low grade ores a speciality. Practical in every detail. State location of mine and salary. Best of references. Address X. Y. Z., this office.

Notice of Removal of Principal Place of Business of Corporation.

WHEREAS, at a special meeting duly called and noticed, of the Directors of the HASKELL GOLD MINING COMPANY, held at the office of Company in San Francisco, the 24th day of April, 1902, a resolution was duly adopted that the principal place of business of the Company be changed and removed from San Francisco, California, to the City of Auburn, County of Placer, State aforesaid, and that notice thereof he published at least once a week for three successive weeks in some newspaper published in the City and County of San Francisco; and

WHEREAS, at said meeting the consent in writing to said change and removal of Stockholders holding more than two-thirds of the capital stock of the company was obtained and filed in the office of the Company,

NOW THEREFORE, notice is hereby given that the HASKELL GOLD MINING COMPANY (a corporation organized and existing under and by virtue of the laws of the State of California) which has heretofore had its principal place of business at San Francisco, State of California, intends to change and remove its said principal place of business from the said City and County of San Francisco, State of California, to the City of Auburn, County of Placer, State of California.

HASKELL GOLD MINING COMPANY,
By HAROLD T. POWER, President.

By order of the Board of Directors.

NOTICE OF ANNUAL MEETING OF STOCKHOLDERS.

In accordance with the By-Laws of that Company the regular Annual Meeting of the Stockholders of the Jamison Mining Company, for the purpose of electing Directors for the ensuing year and transacting such other business as may properly come before it, will he held at the office of the Company, Room 620 Hayward Building, northeast corner of California and Montgomery Streets, San Francisco, California, at 2 o'clock P. M. on Monday, the 19th day of May, 1902.

By order of the Board of Directors.
SAM. W. CHEYNEY, Secretary.

To Stockholders of the Jamison Mining Company:

REMOVAL OF THE SAN FRANCISCO OFFICES OF THE COMPANY.

By order of the Board of Directors, made at a meeting of Tuesday, April 29th, 1902, the San Francisco offices of the Company were changed from 120 Sutter Street to Room 620 Hayward Building, northeast corner of California and Montgomery Streets, San Francisco, California.

SAM. W. CHEYNEY, Secretary.

BEGEER'S
IMPROVEMENT OF
Cyanide Process.

Insures highest and quickest possible extraction. Does not increase working cost; can be attached to any cyanide plant at small expense Does not present any mechanical difficulties and does not foul solutions. Has doubled leaching capacity in practical mill operation and thereby greatly reduced working expenses.

Write for particulars to

G. E. ALEXANDER,
McPhee Building,
DENVER, COLO.

IT GOES without saying that when you find Lenses superior to all others, satisfying your optical needs, you will stick to them.

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Scientific and Dispensing Opticians.
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(NEXT TO HALE'S)
SAN FRANCISCO, CAL.

OAKLAND.....456 Thirteenth Street.
SACRAMENTO.....526 K Street.
STOCKTON.....115 East Main Street.

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BY THE FLASK OR CARLOAD.
WEIGHT AND QUALITY GUARANTEED.
The Eureka Company,
OF SAN FRANCISCO.
320 SANSOME STREET, - SAN FRANCISCO.

Quicksilver

IN LOTS TO SUIT.
Write for Quotations.
REDINGTON & CO, 23-25-27 Second Street,
SAN FRANCISCO, CAL.

INVENTORS, Take Notice!
L. PETERSON, MODEL MAKER
541A MISSION STREET, bet. First and Second Sts., SAN FRANCISCO. Experimental machinery and all kinds of models. Tin and brasswork. All communications *strictly confidential*

ASSESSMENT NOTICES.

SILVER KING MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Pioneer Mining District, Pinal County, Arizona Territory.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 17th day of April, 1902, an assessment (No. 24) of one ($1) dollar per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, 310 Pine street, Room 36, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 27th day of May, 1902, will be delinquent, and advertised for sale at public sanction; and unless payment is made before, will be sold on TUESDAY, the 24th day of June, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.
J. W. PEW, Secretary.

Office—310 Pine street, Room 36, San Francisco, California.

MARINA MARSICANO GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Sunny Hill, Shasta County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 21st day of April, 1902, an assessment (No. 29) of seven (7) cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, 217 Sacramento street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 20th day of June, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on FRIDAY, the 18th day of July, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.
CHAS. BOVONE, Secretary.

Office—217 Sacramento street, San Francisco, California.

DELINQUENT SALE NOTICE.

VIRGINIA CONSOLIDATED MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Kearsarge Mountain, Inyo County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 12) levied on the 2nd day of April, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
Amiraux, P.	281	50	$1 00
Benard, A. F., Trustee	53	227	4 54
Benard, A. F., Trustee	97	100	2 00
Benard, A. F., Trustee	296	1 000	20 00
Benard, A. F., Trustee	287	340	6 80
Benard, A. F., Trustee	288	300	6 00
Benard, A. F., Trustee	188	100	2 00
Chenot, Eugene, Trustee	111	504	10 08
Chenot, Eugene, Trustee	114	340	6 80
Chenot, Edward	237	400	8 00
Chenot, Edward	238	375	7 50
Chenot, Eugene E.	278	252	5 04
Chenot, Eugene E.	279	150	3 00
Chenot, Eugene E.	280	100	2 00
Chenot, Catherine	272	10,500	210 00
Chase, H. O.	282	100	2 00
Chase, H. O.	293	4,758	95 16
Donnelly, Jno. H.	59	50	1 00
Demeine, Jno. H.	60	682	13 64
Bitterlin, Jos.	68	1,654	33 08
McGrath, P. F.	17	700	14 00
McGrath, P. F.	276	600	12 00
Matton, Jno.	38	5 000	100 00
Matton, Jno.	48	100	2 00
Matton, Jno.	194	227	4 54
Matton, Ellen	284	2,602	52 04
Muilen, Jno., Trustee	290	200	4 00
Sullivan, Michael	241	250	5 00
Warren, J. K.	187	454	9 08

And in accordance with law, and an order from the Board of Directors, made on the 2nd day of April, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of S. P. Middleton, 11 Montgomery street, San Francisco, California, on MONDAY, the 26th day of May, 1902, at the hour of 2 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of sale.

B. A. BENARD, Secretary.

Office—147 Larkin street, San Francisco, California.

DELINQUENT SALE NOTICE.

LITTLE STANDARD OIL COMPANY.—Location of principal place of business, San Francisco, California; location of works, McKittrick District, Kern County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 8) levied on the 4th day of March, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
Geo. E. Whittaker, Trustee	5	5	$ 50
Edward McGarry	109	333	33 30
Edward McGarry	129	423	42 30
W. A. C. Smith	112	1,000	100 00
W. A. C. Smith	124	213	21 30
W. A. C. Smith	134	107	10 70
F. W. McNear	118	215	21 50
W. B. Donnelly	135	5	50
J. H. Spring, Trustee	126	1,262	126 20
J. H. Spring, Trustee	127	1,262	126 20

And in accordance with law, and an order from the Board of Directors, made on the 4th day of March, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, Room 40, Chronicle Building, San Francisco, California, on MONDAY, the 12th day of May, 1902, at the hour of 2:30 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of sale.

R. L. CHENEY, Secretary.

Office—Room 40, Chronicle Building, San Francisco, California.

POSTPONEMENT.

By order of the Board of Directors the day of sale of the above delinquent stock has been postponed to MONDAY, the 2nd day of June, 1902, at the same hour and place.

R. L. CHENEY, Secretary.

Office—Room 40, Chronicle Building, San Francisco, California.

Lemhi Mining and Real Estate Exchange,

P. O. Box 165, SALMON CITY, IDAHO.
Thunder Mountain Properties a Specialty.
GOLD, SILVER AND COPPER QUARTZ MINES.
Contracts for Mills and Mining Plants.
Reports on Mines.

WANTED.

WANTED.—A PRACTICAL CONCENTRATOR man, one who has had considerable experience with horonite and copper glance ores. State references and salary. Address "ETHEL" Copper Mining Co., Index, Wash.

Wanted to Bond a Dry Placer Claim, One Rich in Flour Gold.

Must he a dry proposition. Address "Placer Claim," care this office.

WANTED TO BUY:

Interest in or all of a going Sampling Works, Ore Business, or Smelting Works. Address with particulars, L. X. D., Mining and Scientific Press, 330 Market St., San Francisco, Cal.

WANTED, for a developed mine in California, a competent mining engineer to look after development and exploration. Must he a full graduate of a recognized mining college and have had several years' practical experience in large iron, coal or copper mines, and he fully skilled in the engineering problems pertaining to extraction, haulage, ventilation, etc. Give full particulars of career, experience, age, etc, to "Vulcan," care of this paper.

WANTED.—A FIRST-CLASS MILL FOREman for 30-stamp mill with concentrators and cyanide tailing plant. Middle-aged or young man of education and extensive experience in above line preferred; must be thoroughly sober and furnish good references as to experience and character, give complete information as to experience, age, salary wanted, etc. Address "Mill Foreman," care of Mining and Scientific Press.

Mine foreman, having practical experience with Arizona copper deposit, understanding the handling of men in a large property, sober and industrious. Best of references required. Wages $6.00 per day. Apply in writing. Address "Copper Sulphide," care Mining and Scientific Press.

WANTED.

Consulting Mining Engineer,

familiar with making examinations of mines, prospects and mineral lands. Address stating experience and references. Moderate salary to start, with advancement to competent man. Position permanent if found satisfactory. Address A., care of Mining and Scientific Press.

STAMP MILL WANTED,

either ten or twenty stamps, second hand, as near Amador County, California, as possible. Must be in good condition, and low as to price—advertiser has himself built mills and then tried to sell, so don't quote fancy figures. Water-power mill preferred; steam no objection, however. Give full details, price, location, condition. Concentrators acceptable if with plant. Will also buy small hoist and any good second hand mine equipment. Address E. N. DARLING, 9 Pine St., New York.

WANT TO INTEREST PARTIES

in group of mines (70 acres) working under bond and lease, profitably shipping 160 tons per month of lead ores. Have developed large reserves of excellent carbonate and sulphide ores of the best of concentrating material. Mill and lead smelter near mine. Will stand a rigid examination.

Address DAN C. TOBIN,
White Pine, Gunnison Co., Colo

Wanted, Capital

to develop a group of mining claims recently discovered in northern California. Six lode locations from 10 to 30 feet in width, carrying gold, silver and copper.

For further particulars, apply to

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CRESCENT CITY, CAL.

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FOR SALE.

FOR SALE.—Controlling interest in an option on 1700 acres of ground, patented, carrying large bodies of gold, silver and copper ores, with ample wood and water, in Sonora, Mexico. Money to be used to secure title, develop, and erect plant. For coin guaranteed report, address Lock Box 35, Redwood, Cal.

QUARTZ AND PLACER PROPERTIES in Siskiyou Co., Cal., for Sale.

Collections attended to. B. K. COLLIER, Attorney-at-Law, Etna Mills, Cal.

Gold Mining Properties For Sale.

Two First-Class Placer Mines,

one having 20 years' record as a producer. Both in good working condition. Terms reasonable.
Address "Enquire," care this office.

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Mines and prospects in British Columbia, the Western States, and Mexico, for sale.
Free milling gold properties a specialty.
Write us for reports and information.
Bank references given.
Address THE MINES EXCHANGE, LTD.,
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158 42/100 Acres of Dredging Property for Sale.

Best location for dredger. Two power lines within ¾ mile. Blueprints furnished to reliable parties, so no agents need apply. Nearest working dredge 1 mile. One building within ¾ mile.

For particulars, address J. H. G. H., Chardon, Butte Co., Cal.

FOR SALE.

Three patented and joining placer claims with seven (7000) thousand tons or more of tailings, having an average assay value of five ($5.00) dollars per ton in gold.

Price, five thousand ($5,000.00) dollars.

For particulars, addresse

JOHN P. SCHMIT,
Helena, Montana.

FOR SALE.

ONE HEINE BOILER.

Five miles from R. R.; built 1896; used only four months, with wood fire; sixty-seven 3¼-inch tubes, 17 feet long, with fittings, and 85 feet of 3-foot smokestack.

For terms and particulars, apply to

L. J. HOHL, Cherokee, Butte Co., Cal.

Molybdenum Ores.

PACIFIC MOLYBDENITE MINING & REDUCTION CO.
594 Parrott Bldg., San Francisco, Cal.
BUYERS OF HIGH-GRADE ORES, CONCENTRATES OR INGOTS.

ADAMANTINE SHOES AND DIES.

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CANDA Improved Self-Locking CAMS.

TAPPETS, BOSSES, ROLL SHELLS AND CRUSHER PLATES.

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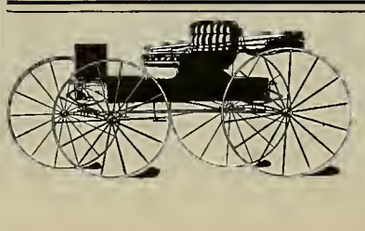

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N. B.—Use the same judgment when buying a vehicle that you exercise when selecting seed wheat or developing a mine.

MINING AND SCIENTIFIC PRESS.

Whole No. 2182.—VOLUME LXXXIV. Number 20. SAN FRANCISCO, CAL., SATURDAY, MAY 17, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Cripple Creek, Colo., Ore Veins.

The fact of wide ore veins in Cripple Creek, Colo., mines is one not generally known. The generally accepted idea is that they are narrow, compensating by richness what they lack in volume. The illustrations of the Captain vein in the Portland mine, at Victor, on this page and on page 269, show a width of mined ore body that is more commonly associated with the mines on the mother lode in California, Deadwood, S. D., and the Treadwell mines at Juneau, Alaska. In the issue of this journal of May 4, 1901, in an article on the Keystone mine, on the mother lode, at Amador, Cal., are illustrations of the lode underground, sufficiently like these illustrations of the Portland lode for both to be considered views in the same mine.

Cripple Creek ore veins are like those of other gold-bearing districts, some large, the great majority small. The characteristic difference is a notable absence of sharp definition between what is ore and what is barren rock. The ore minerals extend out from a rich streak into the country rock without sensibly changing its appearance, but gradually diminishing till they are no longer regarded as payable. What is payable and what is not is a different value in different mines. The range is considerable within the limits of one district. At some of the mines $6 and $7 a ton ore is regarded as payable; at others $16 to $20 ore just pays costs.

Such a wide range of the lower limit of payable values is suggestive of possibilities in mining and treatment which will reduce the difference. The causes which operate to create it are many of them eliminatable. A common system of mine drainage by tunnel, providing at the same time an outlet for ore, would remove one cause of the difference. A cheapening of the milling costs would be another. By reducing the minimum limit of pay values the payable width of vein that could be broken out of mines on the narrow veins would be increased and the ton cost of mining correspondingly reduced.

Low-grade ores in the Cripple Creek mines will be the mainstay of their mining. There is no advantage gained by deferring the time when the low-grade ores shall become available. It is certainly not economy to take out a part of the width of an ore vein at one time and to thereafter keep up the opening until the remainder of it becomes pay ore. It does not pay to lock up capital in taking out this possible ore now at a high cost for mining to let it remain on a dump awaiting cheaper transportation and treatment than at present. The present system of leasing, while adapted to existing conditions, is a wasteful system that can be improved once the minimum values of what is pay ore are reduced to their real minimum.

The problem, so far as mine owners are concerned, is purely commercial. How much will it pay, and how soon will it pay, to work their mines for all that there is in them rather than for part of what is in them? It is quite within the ability of engineers, guided by the results of mining to date, to solve this problem. It looks big so long as the elements are unknown. Once known, it will be found easily within the combined resources of the mine owners who will profit by it. Every mine in Cripple Creek district has not the great veins of the Portland, but many of them, with less profit possible from mining narrower veins under existing conditions, will find their payable veins widened, and their profits increased, after the causes which keep the minimum limiting the value of pay ore up have been removed as suggested.

Cripple Creek district is well suited to the application of the community of interest principle to its exploitation. Its metal production is gold, so that commercial questions as to market and price cannot hamper joint action. The district is fairly com-

Captain Vein, No. 5, 400 Level, Portland Mine, Victor, Colo.

pact, and a common drainage system would make a new mine floor for all the mines at nearly the same depth below the surface. The laterals off from the main tunnel will all be near enough of a length, so that the mines would benefit at reasonably near the same time. The outlet to ore furnished by the drain tunnels would be closer in distance and less in cost of transportation to reduction works than at present, in addition to saving the hoisting expense. The system of treatment for all the ores is about the same and works could be designed for all the mines combined that would give the highest possible economy of cost in working to all of them. The elimination of general operative losses that can not now be eliminated would aggregate an enormous sum. This includes the unwatering of mines left unworked for a greater or less length of time, the cost of maintenance during periods of labor difficulties and the losses by theft of rich ore.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

J. F. HALLORAN..... Publisher.

San Francisco, May 17, 1902.

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Elimination of Wastes in Mining.

A striking characteristic of existing mining and metallurgical practice is the effort to reduce, and to even eliminate altogether, avoidable wastes. The object is, of course, to increase profit through making production at a lower cost. This effort does not always result in conspicuous successes, but the penalty of continuous failure is so disastrous and inevitable that the effort is always being made. One improvement is found to be the suggestion for yet another, so that no practice can be finally considered as settled permanently beyond the possibility of improving modifications.

Operations are on so enormous a scale at the present time that exceedingly small unit savings and additions to the profit margin aggregate large sums. These large operations having commercial advantages as such over small ones of the same kind, the improvements and economies are even more necessary to the latter. There is a very general tendency to substitute machinery for labor wherever it can be done. Men are required to do less of the heavy manual work of mining and ore reduction and more directing of machines. The ore output of a mine is increased by machine operation at the same time that the number of men and the cost per unit of the output are reduced. Accurate accounts are kept of all the separable operations about a mine or plant to see where more efficiency can be had and the cost reduced thereby. The economic point is closely studied so that a saving made in one direction shall not be carried on till it produces a net loss in another direction.

Ore concentration has developed a new branch of metallurgy, which may be termed ore separation or parting. There is much to be done in this direction yet that will repay the investigation of workers. The losses of minerals are in many concentrations and separations far too considerable. There is no profit in taking mineral out of the earth if it is wasted afterward. Losses of 15%, 20%, 25% and 30% of mineral should not be definitely accepted as good enough practice. The difference that remains to be recovered may turn out to be recoverable at a profit which will make the difference between success or failure, should the market price lower or the ore get leaner. The saving made in copper mineral recovery at some of the Lake Michigan mines by changing the stamping is an illustration of the money value of saving an avoidable waste. There is no reason to assume that it could not have been accomplished sooner had the money value of it been a necessity. Made earlier, it would not be necessary to be at the cost of going into Lake Linden to dredge up tailings to work them over for copper. There would have been no copper in them to be recovered. Cripple Creek, Colo., waste dumps and the numerous piles of stamp mill tailings throughout the mining districts of the West are all examples of avoidable wastes.

The fact that it pays to work these old wastes is an incentive to avoid their duplication in wasted values or unnecessary costs at the present time. The selection of a reduction process for the ores of a mine is no longer a simple affair. As a rule there is always more than one known process that will accomplish the reduction, and some unknown that will yield to a study of the conditions. It pays to work these down to a comparative basis of the respective profits before making a final selection. It pays to devise new schemes if thereby unavoidable waste is eliminated.

Cheap Power Development on the Pacific Coast.

It is not so many years ago, nor even many months ago, that the Pacific coast had the patronizing sympathy of Eastern people over its deficiency in cheap power. It was conceded that the Pacific coast had vast, unoccupied areas, enormous natural resources in minerals, a wonderfully productive soil, and the best climate and some of the biggest things in the world. But the Pacific coast could never manufacture its raw material production, and must always remain subordinate, commercially and industrially, to the East, because there was no cheap source of power. Cheap coal and iron were believed to insure to the Atlantic coast an indefinite period of supremacy over the Pacific coast.

It is certainly the fact now that so far as cheap power is concerned the Pacific coast is in a fair way to reverse the conditions. Also the cheapening of the cost of making iron is providing an opportunity for the Pacific coast to engage in its manufacture. This last may seem surprising since it is within memory that the cheapening of the manufacture of iron on the Atlantic coast twenty years ago forced the abandonment of the first iron making industries on this coast at Clipper Gap, Cal., and Irondale, Wash. Nevertheless, the further great reduction in the cost of manufacture there has contributed to renew the opportunity here. The reason for this is that the later economies introduced into the business are as possible here as there, and the cost of transportation from the East to the Pacific coast has not been reduced in the same ratio as have manufacturing costs. This transportation cost has now become the largest single item in the cost of iron to the Pacific coast consumers, and will, on the establishment of the iron industry here, provide the profit margin for the manufacturers.

The development of the fuel oil industry in California has not only provided the Pacific coast with a cheaper substitute for the cheap coal of the Atlantic coast for all general power producing purposes, but it is forcing the utilization of the developed coal resources of the Pacific coast in work for which the cheaper petroleum is not adapted. For instance, the Southern Pacific Railroad Co., which was supplying its locomotives with coal from its own mines at Carbonado, Wash., having supplied its locomotives with the cheaper petroleum fuel, is now engaged in manufacturing the product of its coal mines into furnace coke at the mines. There it will be cheaply manufactured in quantities that can only find a market in the blast furnace work of iron and steel manufacture. This coke is to be made in by-product ovens, utilizing the oven gases as another cheap source of power, and the chemicals produced to lessen the cost of coke, which in the end, with allowance for the difference in quality, will make iron and steel nearly as cheaply as it is made east of the Rocky mountains at the present time. The invention recently announced of the process of making steel direct from the ore, still further reducing the cost of its manufacture, by increasing the ratio of the cost of transportation from the East to the flat cost of manufacture on this Pacific coast, also increases the percentage profit margin possible on its manufacture here.

Cheap fuel oil and cheap coal and coke are not the only cheap power resources of the Pacific coast under development. Furnishing the cheapest power of all is the electrical development of the water powers in the mountain streams. Like the petroleum and the coal, this water power electrically transmitted has its special fields of use in which the entry of the others as competitors is not practicable. The development of these electrical transmissions of water power will not in the end displace the other two, but add to their sum total. The Pacific coast region is, as compared with the Atlantic coast region, much more mountainous. Its streams have their sources at higher elevations and fall more rapidly to the ocean. They lie closer to the coast and to the seaport cities than on the Atlantic coast. The milder climate keeps the smaller streams unfrozen during the winter. The net result of these favoring conditions is that water power on the Pacific coast can be economically developed in smaller units than on the Atlantic coast and at a much less cost per unit. This advantage at the hydraulic end of an electrical power transmission proposition is so considerable that it more than offsets the extra cost of the electrical end of the installation due to the increased amount of copper required for the long distances of transmission.

The economy of small units of hydraulic installation is a considerable commercial advantage. It enables the capital investment to go in as it becomes income producing instead of in advance of it. For example a projected power plant installation on the Mississippi river had to be planned to utilize 60,000 H. P. in order to pay interest on the cost of the hydraulic end of the installation. Not being able to sell this the project had to be deferred. On the Pacific coast initial installations in units as small as 3000 H. P. are commercially profitable and can be made without putting capital into the hydraulic end far in advance of its becoming income earning.

The low heads and large volumes of water of Eastern plants make the cost per unit of the hydraulic end of the project much higher than on the Pacific coast, where high heads and small quantities of water are possible of utilization. The variations between the different projects in capital investment per unit of power output on the Pacific coast is quite considerable, as would naturally be expected. Per horse power delivered at the consuming end of the transmission the capital costs of installation, including both water and electrical, range from $120 to over $500. The majority of installations range about $250 per H. P. delivered at the end of the transmission. The expense of maintenance and operation is low so that with even the highest cost of installation noted the power is cheap power.

Enormous as is the possible aggregate of power that can be developed from water and electrically transmitted to the Pacific coast seaport cities for utilization, it does not appear that there will be an over supply. The establishments already made have so far found the market ahead of them, able to take all the power offered and wanting more.

THERE is a disposition by the public at large to let the imagination influence its ideas of mine valuation. Few people realize how many dollars have to be put into a mine to get more dollars out, and not necessarily many more, either. Great values are put on stocks frequently which do not exist in the ground. It is not realized that all of the metal in the mine is not an available fund for profit. There would not be so much mischief in this extravagance of ideas if it was limited to the mine owners themselves. The real mischief is the influence the ideas of great profits and vast wealth in mines have on those people who do not own mines and on officials who levy taxes. These people and officials think that if mine profits are so large, and the wealth in mines so enormous, the mines should pay a larger sum in taxes or royalties. The effort to so load the industry always shows that the extravagant ideas of great profits and enormous valuation are an overestimation, but not until the industry has undergone a squeezing from which much time is required to make recovery. The British Government is dallying with propositions to transfer the taxation on account of the Boer war to the mines on the Rand. That the proposition should receive serious attention shows how far afield popular comprehension of the Transvaal mines is. It is to be hoped that nothing of the kind will be undertaken. The Rand mines left unhampered by royalty taxation of the kind contemplated will speedily make a gold output which, livening all other British industries, will make its present burden of war taxation no burden at all.

Concentrates.

A LODE mining claim can be legally located in the form of a rhomboid.

THE American production of copper is about three times that of Europe.

THE location of a mining claim near a well-known mine is by itself no assurance of probable value in the mining claim.

A GOOD blacksmith's welding compound is said to be made of 12 ounces of borax, 2 ounces carbonate of iron and 2 ounces bicarbonate of soda.

A MINER'S INCH OF WATER in a reservoir is 2160 cubic feet. A reservoir to store 50,000 inches of water would be of 108,000,000 cubic feet capacity.

TWELVE oil wells put down by the Peerless Oil Co. in the Bakersfield, Cal., petroleum field, averaging 1000 feet in depth, cost from $3011.14 to $5612.32, the average cost per well being $4302.58.

ORE DRESSING, while resembling concentration very closely in its general features, implies the separation of two minerals, each valuable in themselves when separated, but valueless when mixed.

THE voltage in common use in direct current electric motors is 500, in the polyphase system 2000 volts pressure is used. The use of the latter permits of a considerable saving in copper used for conduits.

GOLD AMALGAM will be liquid if the percentage of gold is as small as 10%. It is in this form that amalgam losses are most apt to occur. Excess of quicksilver should not be fed into stamp batteries.

THE courts of California have held buried river channel deposits locatable as placer claims. Other courts have held that claims almost identical with the one mentioned in the California case may be located as a vein in place.

WHERE the records of location and conveyance of a mining claim are lost or destroyed, proof of five years' continuous uncontested possession will enable the owner to get a patent. It is better in such cases to make a relocation.

WHAT is known as the oil concentration process for sulphurets—with more exactness it should be oil separation process—is said to effectively separate chalcopyrite from magnetite. Magnetic concentrators will also make this separation.

THE expense of operating a telephone system has been found to increase in geometrical ratio with the number of telephones in the system. If the number of telephones is doubled the expense of operation will be somewhat near quadrupled.

BRASS which contains copper 90% and tin 10%, and which contains only traces of lead, zinc and iron, is exceedingly resistant to the solvent action of sea water. A coating forms with the copper as the base which protects the metal underneath from being further eaten into.

ALL the quartz mines in California are working lower grade ores than the same mines in the period of early day mining, but they are all working more tonnage. The lowering of the grade of ore from which the output of a mine is made does not necessarily mean that the mine is petering out.

THE oil used in the so-called oil concentration process is a residuum of petroleum distillation. It is cheap, and the oil lost—about two gallons to the ton of ore treated—is principally with the sulphide minerals, from which its value is effectively recovered as heat in their subsequent roasting or smelting.

A COTTON ROPE is preferable for transmitting power to a hemp rope. Either, before being used, should have the stretch taken out. The cotton rope is smoother than a hemp rope and, compared with one of the same diameter, gets more surface in contact with the pulleys and a better grip on them.

ALL natural building stone will absorb water and collect dirt which cannot be washed out. A sand blast will clean it by resurfacing the stone. Stone filling compositions have been invented which filling the capillaries at the surface prevent the entry of water and dirt. The stone can then be washed clean.

THE revised statutes do not in express terms require discovery as a prerequisite to location, and it has been held in California and by courts in other States in effect that none is necessary, but under the provisions of Section 2319 it does not appear how the character of mineral ground can be determined in any other way than by discovery.

IT would be a distinct advantage to the mining industry if it were required by law that the underground workings of mines should be mapped up to date at least once a year while the mine is operating—the maps, when the mine is closed down, to be filed with some properly authorized official, so that they would become available when it is desired to reopen the mine.

A DRIVE ROPE should not be permitted to slip on the pulleys any more than a belt would be permitted to slip. The slipping means that an avoidable loss of power is being made; also that the rope is in danger of receiving injury by getting off of the pulleys. The trouble may be either too small a rope for the power it is called upon to transmit or the rope may be slack from stretching.

IT is held in California and Nevada that if one abandons tailings from his mine or works and they flow down stream and become deposited on the lands of another, they belong to that other, and if they accumulate on unappropriated public land it has been the custom to recognize the right of the first comer to appropriate them by proceedings analogous to the location of placer claims.

ONE certificate of annual assessment work will answer for the recording of the work on a group of claims. The certificate should mention specifically the claims by name, the amount of work done, where it was done, the nature of it and its relation to the development of claims for which it is done. The last is not a requirement of the law, but properly done it will tend to prevent claim jumping disputes.

IT is estimated that a 20% reduction will be made in working costs of gold mining in the Transvaal under the British government of the country. This addition to the profit margin will have a greater proportionate effect in extending the mining to ores of lower grade. Roughly, it is estimated that under Boer rule mining costs averaged about $6 a ton. The reduction will bring this to $4.80 a ton.

THE flat costs per foot of driving a drift heading, as between hand and machine drilling, are not by themselves to be taken as determining the question of which is the cheaper. The hand drilling may cost materially less per foot than the machine drill work, but the longer time taken to make the same advance adds so largely to this cost from the general expense of the operation that it becomes the more costly.

GOLD frequently occurs impregnated in volcanic rocks and occasionally in sedimentary rocks. Rhyolite is, perhaps, the commonest species of volcanic rock carrying gold. This is the characteristic gold-bearing rock at Thunder mountain, Idaho. There it is soft and without distinct crystallization. Elsewhere gold has been found in rhyolite species of hard, compact crystalline structure. Diorite is another eruptive that is sometimes gold-bearing.

ELECTRICAL GENERATORS and motors, while they will work under a peak load, which is a considerable overload, should be subjected to this kind of strain to as little an extent as possible. The load should be kept preferably constant. Storage batteries can be used to equalize the generator load, or at a mine a compressor plant can be driven intermediate between the electric motor and the machinery which has great variations of load, such as the hoisting rig.

A BLANKET VEIN is an inexact descriptive term for a vein that approximates a horizontal plane in dip and strike. There is no definite angle of dip limiting the definition. Veins having a dip of as little as 15° are not necessarily blanket veins, though the term might be applied to one vein of this dip where the prevailing vein dip was much greater. The outcrop of a flat vein can be located on and followed on the dip, just as any other vein can, unless the local laws or customs provide otherwise.

A MINER'S INCH in California is legally 1.5 cubic foot of water flow per minute, and 20 inches would be 30 cubic feet, which, at 62.25 pounds per foot, would weigh 1867.5 pounds. This weight of water falling 26 feet, the full diameter of the overshot wheel would generate 48,555 foot pounds of energy per minute, or, divided by 33,000, 1.4712 + horse power. But the overshot water wheel would not develop but two-thirds to three-fourths of this, or, say, 70%, which would be practically only 1 H. P.

THE workman who knows how to strike a fair balance between labor lost and material saved is worth encouraging. He is an intelligent fellow and, without doubt, is a safe man in other directions also. On the other hand, there are men showily smart at their work who are great and incurable wasters. The money value of their wastefulness should be debited against the sum total of their usefulness. At the other extreme there are a few who are too nervous with the stuff. They undervalue their time and overvalue the material.

IT is a perfectly safe proposition to observe the exact letter of the law in making a mining location. Certain special contingencies may make it proper to deviate from the letter of the law while observing the spirit of it. That is your reasonable view of it. It is ours, also. But we have always observed it never is the view the third man's lawyer takes of it. He does not know your view or our view. He knows the letter of the statute though; so you had better conform to it and let the other man's lawyer do the wrestling with the spirit.

DEAD WORK in a mine is any work underground which does not directly produce ore or the metal or mineral for which the mine is operated. Mine managers have subdivisions for classifying dead work under which some of it keeps off of the report as dead work. Timbering in drifts which are solely mine openings is dead work without any qualification. Timbering a stope is, however, properly directly chargeable to the cost of mining the ore. Waste rock taken out of the mine is dead work. Waste used for filling stopes is properly directly chargeable to the cost of mining.

A TRIAL of Beaumont, Texas, fuel oil in a sea going steamer recently showed a consumption of 800 barrels of oil displacing 218 tons of coal, the oil costing just one-half the cost of the coal, five men tending to making steam in place of eleven with coal. A gain of ½ to 1 knot an hour was made in speed. The direct saving in fuel and wages amounted to $770 a month. The saving due to increased speed is not reported, but assuming that the ship was at sea 60% of the time, the saving in time at sea would reduce the entire expense of operation about 6%.

THE water used to drive the water wheel in a water power air compressor can be used afterwards to cool the air compressed. It is good and economical practice to cool the air before it enters the compressor, to cool it again while being compressed, to give it a third cooling between the compressors where a two or three-stage compression is made, and finally to cool it after it leaves the last compressor. Each cooling saves power employed in making compression. If the same water used for power is used for cooling the cost of cooling is only interest and repairs on the cooling plant. After the air leaves the receiver and before it is used, the quantity of heat that has been taken from it put back into it again adds to its effective working value.

A RIVER BED alongside of a bar rich in placer gold is not likely to be equally productive. The bar was the situs of the original channel of the stream through a many times longer period than the existing channel represents. The latter, relatively, represents only a temporary diversion from the old channel situs. Conversely, the existing bed of a stream, if rich in gold, is evidence that the bars lying closely alongside are comparatively or even absolutely barren. High bars may be equally as rich as the present stream channel under such conditions. These statements are broad generalizations, but observation will confirm them, and they are safe to use in estimating the commercial value of untried placer ground alongside of rich worked ground.

IT is possible to build a ditch on a 30° mountain slope into a California river canyon that will be 40 feet wide and 10 feet deep. The excavation required would be 70 cubic yards to the linear foot of ditch. The cost of making this excavation would be about $1 a cubic yard and would make a mile of such ditch cost about $400,000. To carry 2500 second feet of water the surface velocity of the current would be about 10 feet per second, which is far too high, 3½ feet per second being the allowable limit. A break in such a ditch would have the destructive effect of a cloud burst on the mountain side down which it would flow. While possible to build such a ditch it would be exceedingly doubtful if it could be operated. It is not a practical construction. There are practical limiting dimensions to side hill ditch construction which should not be exceeded if a stable economical construction is desired.

THE common method of determining the nature and amount of the different elements of coal is by what is termed a proximate analysis, which is made by pulverizing a weighed sample of coal and then subjecting it to repeated heating not exceeding 280° F. The coal is then weighed and the difference between its original and present weight is counted as the percentage of moisture. The coal is then placed in a covered crucible and gradually heated to a red color, and there maintained until gases cease to be thrown off; and, after being cooled, is again weighed and the difference noted as volatile matter. An increased heat is then applied until a white color is shown and air enough is admitted to supply oxygen, this part of the process being continued until all the carbon is burned away, when the shrinkage, as shown by weighing at this stage, is recorded as the fixed carbon, the residue being ash, or, if mineral exists, small clinkers.

A COPPER ORE assaying 7% copper by wet assay, .12 ounce gold and 4 5 ounces silver would be taken by smelters about as follows, the New York price of casting copper being 12 cents per pound, silver 54 cents per ounce and gold $20 per ounce: For the copper 7% less 1.3%, leaving 5.7% at 20 pounds = 114 pounds paid for at 12 cents less 6 cents, or 6 cents, $6.84; for gold, .12 ounce less 5% is .112 ounce at $20 = $2 24; for silver, 4.5 ounce less 5% equals 4.27 ounces at 54 cents is $2.30, making gross value per ton $11.38, less smelting charges $6, makes net value of ore paid producer $5 38, from which must be paid transportation and mining. From this ore under some circumstances an assayer might return full market and mint values without any deductions at all, showing gross metal values amounting to $21.71. The difference between this and $5.38, the commercial value, $16.33 disappears as loss in the slags, costs of smelting and transportation, refining and minting of smelting products.

THE brown iron oxide outcrop of a vein in metamorphic rocks is an indication of the presence of sulphide minerals in the veins below water level. The brown oxide is the result of nature's oxidization of iron sulphide, pyrite usually, by the oxygen carried by the percolating surface waters. The brown oxide sometimes takes the cubic form of crystal of the pyrite that it replaces, forming what in crystallography of minerals is known as a pseudomorph. The presence of copper sulphides and iron sulphides in the brown oxide at 50 feet depth is probably an indication of nearness to the water level. The quartz crystals undergo no alteration during the process of oxidization of the iron and copper sulphides, so that the impressed forms of other crystals are the result of the original formation of the quartz crystals around them. A hematite cropping may be, and generally in the Rocky mountains is, a capping to copper ore deposits whether or not a rich enough ore to make a mine can only be determined by mining it. Any gold in the original sulphide mineral would be in the iron oxides.

Costs and Profits in Pyritic Smelting of Low-Grade Copper Ores

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS by F. H PRENTISS, E. M.

The profit by smelting direct (with limestone flux) as given in column 35 is obtained by subtractions from the $17 matting value the sum of the costs and losses as given in columns 11, 17, 18 and 26, together with the cost of mining ($2.25) and general expenses (0.17).

Column 36 is obtained by adding the figures given in columns 21, 25 and 26 and dividing by the matting value ($17).

Columns 37, 38 and 39 are obtained by deducting the actual loss in concentrations (30%, 25% or 20%, as the case may be) from the number in column 36 corresponding to the type of ore and multiplying the difference by $17 (the matting value).

MATTING VALUE, $17 PER TON.

Cost of Mining, $2.25, and General Expenses, 0.17.

Type...	Profit Per Ton by Smelting Direct.	Loss in Concentrating That Would Offset Gain.	Extra Profit Made by Using Sulphurets to Reduce Barren Flux When Concentrating Loss Is 30%	25%	20%
A	$11.62	21.7%	$....	$....	$ .29
B	10.95	25 2	....	.03	.88
C	10 28	28.6	...	.61	1.46
D	9 62	32.0	.34	1.19	2.04
E	8 95	35.4	.93	1.78	2.63
F	8.28	38 8	1.50	2.35	3.20
G	7.61	42 2	2.08	2.93	3.78
H	6 94	45 5	2.65	3.50	4.35
I	6 24	48 9	3.21	4.06	5.91
J	5.60	52.3	3 79	4.64	5.49
K	4.92	55.7	4.37	5.22	6.07
	35	36	37	38	39

MATTING VALUE, $16 PER TON.

A	$10.62	23.1%	$....	$....	$ .50
B	9 95	26 7	....	.27	1.07
C	9 28	30 3	.05	.85	1.65
D	8.62	34 0	.64	1.44	2.24
E	7 95	37.6	1.23	2.03	2.83
F	7.28	41 2	1.80	2.60	3.40
G	6.61	44 8	3.37	3.17	3.97
H	5 94	48 3	2.94	3.74	4.54
I	5 24	51 9	3.51	4.31	5.11
J	4.60	55 5	4.08	4.88	5.68
K	3.92	59.2	4.65	5.45	6.25
	40	41	42	43	44

MATTING VALUE, $15 PER TON.

A	$9.62	24.7%	$....	$....	$ 70
B	8 95	28 7	....	.52	1.27
C	8 28	32 5	.37	1.12	1.87
D	7 62	36.3	.95	1.70	2.45
E	6.95	40.1	1.52	2.27	3.02
F	6 28	43 9	2.09	2.84	3.59
G	5.61	47.7	2.65	3.40	4.15
H	4 94	51.5	3.23	3.98	4.73
I	4.24	55.3	3.82	4.57	5.32
J	3.60	59 3.	4.39	5.14	5.89
K	2.92	63.2	4.98	5.73	6.48
	45	46	47	48	49

MATTING VALUE, $14 PER TON.

A	$8 62	26.4%	$....	$ .22	.92
B	7.95	30.6	....	.80	1 50
C	7.28	34 8	.67	1.37	2.07
D	6.62	38.9	1.25	1.95	2.65
E	5.95	43.0	1.82	2.52	3.23
F	5.28	47.1	2.40	3.10	3.80
G	4 61	51.1	2.96	3.66	4.36
H	3 94	55.2	3.53	4 23	4.93
I	3.27	59.3	4.11	4.81	5.51
J	2.60	66 5	4.68	5.38	6.08
K	1.92	67.7	5.27	5.97	6.67
	50	51	52	53	54

MATTING VALUE, $13 PER TON.

A	$7.62	28.4%	$....	$ .47	$1.12
B	6 95	32 9	.38	1.04	1.69
C	6.28	37.4	.97	1.62	2.27
D	5.62	41.7	1.54	2.18	2.84
E	4 95	46.2	2.11	2.76	3.41
F	4 28	50 8	2.69	3.34	3.99
G	3 61	55 3	3.26	3.92	4.58
H	2.94	59.6	3.84	4.49	5.15
I	2 27	64.1	4.43	5.08	5.73
J	1 60	68 4	5.00	5.65	6.30
K	.92	72 9	5.58	6.23	6.89
	55	56	57	58	59

MATTING VALUE, $12 PER TON.

A	$6.62	30 7%	$ .10	$ .70	$1.30
B	5.95	35 6	.67	1.27	1 87
C	5.28	40.5	1.26	1.86	2.46
D	4.62	45 3	1.84	2.43	3.03
E	3 95	50.0	2.41	3.01	3.61
F	3 28	54.8	2.99	3.59	4.19
G	2.61	59 6	3.56	4.16	4.76
H	1.94	64 4	4.12	4.72	5.32
I	1.27	69.3	4.70	5.30	5.90
J	.60	74.1	5.28	5.88	6.48
K	— .08	79.0	5.87	6.47	7.07
	60	61	62	63	64

At type K (matting value $12 per ton) we begin to find a loss in smelting with barren limestone flux. This loss must be subtracted from the concentrating gain given in columns 62, 63 and 64. While the silica is quite truly a necessary part of the slag, the method of calculation requires the silica to be debited with the cost of limestone and coke it requires, and the iron and sulphur to be credited with the limestone and coke they replace.

MATTING VALUE, $11 PER TON.

A	$5 62	33.6%	$ .40	$ .95	$1 50
B	4 95	38 9	.98	1.53	2.08
C	4 28	44 2	1.56	2.11	2.66
D	3 62	49 4	2.13	2.68	3.23
E	2 95	54 6	2.70	3.25	3.80
F	2 28	59.8	3.28	3.83	4.38
G	1.61	65.0	3.85	4.40	4.95
H	.94	70.2	4.42	4.97	5.52
I	.27	75 5	5.01	5.56	6.11
J	— .40	80.8	5.59	6.14	6.69
K	— 1 08	86 1	6.18	6.73	7.30
	65	66	67	68	69

MATTING VALUE, $10 PER TON.

A	$4.62	37 0%	.70	$1.20	$1.70
B	3.95	42 8	1.28	1.78	2.28
C	3.28	48.6	1.86	2.36	2.86
D	2 62	54 4	2.44	2.94	3.44
E	1.95	60 1	3.01	3.51	4.01
F	1 28	65 8	3.58	4.08	4.58
G	.61	71.5	4.16	4.66	5.16
H	— .06	77 3	4.73	5.23	5.73
I	— .73	83 1	5.31	5.81	6.31
J	— 1.40	88 9	5.89	6.39	6.89
K	— 2.07	94 8	6.48	6.98	7.48
	70	71	72	73	74

MATTING VALUE, $9 PER TON.

A	$3.62	41.1%	$1.00	$1.45	$1.90
B	2 95	47.6	1.58	2.03	2.48
C	2.28	54 0	2.16	2.61	3.06
D	1 62	60.4	2.74	3.19	3.64
E	.95	66.8	3.31	3.76	4.21
F	.28	73.1	3.88	4.33	4.78
G	— .39	79 8	4.45	4.90	5.35
H	— 1 06	85 9	5.02	5.47	5.92
I	— 1 73	92 4	5.61	6.06	6.51
J	— 2 40	98 8	6.18	6.64	7.09
K	— 3.07	105.4	6.78	7.23	7.68
	75	76	77	78	79

105.4% loss (column 76) is, of course, a mathematical expression, as we cannot lose in concentrating more copper, gold and silver than the ore contains. The point is that the cost and loss in smelting of that type and value of ore are so great that we could afford equally well to pay the cost of concentrating, and lose all the available metal value and 5.4% more.

MATTING VALUE, $8 PER TON.

A	$2 62	46.2%	$1.30	$1.70	$2.10
B	1.95	53 5	1.88	2.28	2.68
C	1.28	60 8	2.46	2.86	3.26
D	.62	68 0	3.00	3.46	3.86
E	— .05	75.2	3.63	4.03	4.44
F	— .72	82 3	4.21	4.61	5.01
G	— 1.39	89 3	4.77	5.18	5.58
H	— 2 06	96 6	5.34	5.75	6.15
I	— 2 73	103 9	5.92	6.33	6.73
J	— 3 40	111.1	6.50	6.90	7.30
K	— 4 08	118 5	7.08	7.48	7.88
	80	81	82	83	84

MATTING VALUE, $7 PER TON.

A	$1.62	52.9%	$1.60	$1.95	$2.30
B	.95	61.2	2.18	2.53	2.88
C	.28	69 5	2.76	3.11	3.46
D	— .38	77.8	3.34	3.69	4.04
E	— 1.05	85 9	3.91	4 36	4.71
F	— 1.72	94 1	4.49	4.84	5.19
G	— 2 39	102.2	5.06	5.41	5.76
H	— 3 06	110.5	5.63	5.98	6.33
I	— 3 73	118 8	6.21	6.56	6.91
J	— 4.40	127.1	6.79	7.14	7.49
K	— 5.08	135 5	7.37	7.72	8.07
	85	86	87	88	89

MATTING VALUE, $6 PER TON.

A	$ .62	61.5%	$1.89	$2.19	$2.49
B	— .05	71 3	2.48	2.78	3.08
C	— .72	81 0	3.06	3.36	3.66
D	— 1.38	90 7	3.64	3.94	4.24
E	— 2 05	100.1	4.21	4.51	4 81
F	— 2 72	109.7	4.78	5.08	5.38
G	— 3.39	119.1	5.35	5.65	5.95
H	— 4.06	128 8	5 93	6.23	6.53
I	— 4.73	138 5	6.51	6.81	7.11
J	— 5.40	148 1	7.09	7.39	7 69
K	— 6.08	158 0	7.68	7.98	8.28
	90	91	92	93	94

MATTING VALUE, $5 PER TON.

A	—$ .38	73 8%	$2.19	$2.44	$2.69
B	— 1 05	85 6	2.78	3.03	3.28
C	— 1.72	97 2	3.36	3.61	3.86
D	— 2 38	108 8	3.94	4.19	4.44
E	— 3 05	120.2	4 51	4.76	5.01
F	— 3 72	131 6	5.08	5 33	5.58
G	— 4 39	143.0	5.65	5.90	6.15
H	— 5 06	154 6	6.23	6.48	6.73
I	— 5.73	166 2	6.81	7.06	7.31
J	— 6 40	177 8	7.38	7.63	7.88
K	— 7.08	189 6	7.96	8.21	8.46
	95	96	97	98	99

MATTING VALUE, $4 PER TON.

A	—$1.38	92.2%	$2.49	$2.69	$2.89
B	— 2 05	107 0	3.08	3.28	3.48
C	— 2 72	121.5	3.66	3.86	4.06
D	— 3 38	136 0	4.24	4.44	4.64
E	— 4 05	150.2	4.81	5.01	5.21
F	— 4 72	164.5	5.38	5.58	5.78
G	— 5 39	178.7	5.95	6.15	6.35
H	— 6 06	193.2	6.53	6.73	6.93
I	— 6 73	207.8	7.11	7.31	7.51
J	— 7 40	222.2	7.69	7.89	8.09
K	— 8.08	237.0	8.28	8.48	8.68
	100	101	102	103	104

MATTING VALUE, $3 PER TON.

A	—$2 38	123.0%	$2.79	$2.94	$3.09
B	— 3 05	142 7	3.38	3.53	3.68
C	— 3 72	162.0	3.96	4.11	4.26
D	— 4 38	181.3	4.54	4.69	4.84
E	— 5 05	200 3	5.11	5.26	5.41
F	— 5.72	219 3	5.68	5.83	5.98
G	— 6 39	238 3	6.25	6.40	6.55
H	— 7.06	257.7	6.83	6.98	7.13
I	— 7 73	277.0	7.41	7.56	7 71
J	— 8 40	296.2	7.99	8.14	8.29
K	— 9 08	316 0	8.57	8.72	8.87
	105	106	107	108	109

CORRECTIONS.—The following deductions from the profits per ton are to be made when the ore mined is less than 100 tons per day, and when the ore smelted (omitting concentrates) is less than 100 tons:

TONS OF ORE MINED OR SMELTED DAILY.

	100	90	80	70	60	50
Smelted	$0.00	$0.05	$0.12	$0.21	$0.33	$0.50
Mined	0.00	0.02	0.04	0.07	0.11	0.17

The foregoing tables are based on 3% copper ore. When the per cent exceeds this an allowance must be made for the additional iron and sulphur carried into the matte. As each unit of copper carries with it (into a 50% matte) ¾% of FeS, equivalent to about 1% FeS_2, a deduction of 5.7 cents per unit of copper must be made for smelting, and about 4 cents (less on account of loss of copper) for ores concentrated.

In case the temperature is not raised 1000° Fahr. by the hot blast apparatus, the following corrections are required:

*DEDUCTION FROM PROFIT PER TON FOR LOWER BLAST TEMPERATURE.

	900	800	700	600	500	400	300	200	100	0
	$	$	$	$	$	$	$	$	$	$
A	.03	.06	.09	.13	.17	.21	.25	.30	.36	.42
B	.03	.07	.10	.14	.18	.23	.27	.33	.39	.46
C	.03	.07	.11	.15	.19	.25	.30	.36	.42	.50
D	.04	.08	.12	.17	.21	.27	.32	.39	.46	.54
E	.04	.08	.13	.18	.23	29	.34	.42	.49	.58
F	.04	.09	.14	.19	.25	.31	.37	.45	.53	.62
G	.05	.10	.15	.21	.26	.33	.39	.48	.56	.67
H	.05	.10	.16	.22	.28	.36	.42	.51	.60	.71
I	.05	.11	.17	.23	.30	.38	.45	.54	.64	.75
J	.05	.11	.17	.25	.31	.40	.47	.57	.68	.80
K	.06	.12	.18	.26	.33	.42	.50	.60	.72	.84

*The increased amount of air required for cold blast smelting means increased power for blast, and hence increased cost in addition to the figures given in the table.

The profit to be derived from such ores depends in a large measure upon the method of working them. For example, the average ore runs about as follows:

SiO_2	62 00%
Fe	10 00%
S	12.00%
Al_2O_3, CaO, FeO, MgO	10 00%
Cu	3 50%

While the assay and matting values are:

	Assay Value.	Matting Value.
Cu	$10.50	$ 7.00
Au	4.25	4.00
Ag	1.25	1.19
Totals	$16.00	$12.19

By hand sorting, the ore may be divided into two equal parts, which for purposes of illustration we will assume to have the compositions and values as follows:

	First Grade.	Second Grade.
SiO_2	52%	72%
Fe	14%	6%
S	17%	7%
Al_2O_3, CaO, FeO, MgO	9%	11%
Cu	5%	2%
ASSAY VALUE.		
Cu	$15.00	$6.00
Au	6.00	2.50
Ag	1.75	.75
Totals	$22.75	$9.25
MATTING VALUE.		
Cu	$10.00	$4.00
Au	5.66	2.36
Ag	1.66	.71
Totals	$17.32	$7.07

The original ore corresponds very closely to Type I,

while the first grade corresponds to Type F and the second to Type K.

The original ore, if smelted direct, would yield (Col. No. 60) $1.27 + .19 + $1.46 profit per ton.

The first grade ore, if smelted alone, would yield (Col. 35) $8 28 + .32 = $8.60, from which must he deducted $2.42 (the cost of mining the second grade ore), which it will not pay to smelt, leaving a net profit of $6.18.

As stated above, the second grade ore cannot be smelted direct except at a loss. Col. No. 85 shows a loss for ore of Type K of matting value of $7, amounting to $5.18 per ton. Col. No. 88 shows that by concentrating (with 25% loss) before smelting a gain is made of $7.72, thus leaving a net gain of $7.72 — $5.18 = $2.54, to which is to he added 7 cents (the matting value of the second grade ore was $7.07), thus making $2 61, or, since the mining cost has already been charged against the first grade ore, the extra profit becomes $2.61 + $2 42 = $5.03, thus making the profit per ton for both first and second grade ores ($6.18 + $5.03) ÷ 2 = $5.60 per ton.

Should we only smelt half the first grade ore direct and concentrate the halance, we should get enough sulphurets to make a self-fluxing mixture, and the profit would he greater.

(TO BE CONTINUED.)

Crude Oil for Tempering Rock Drills.

TO THE EDITOR:—I have been experimenting lately on the use of common crude oil for tempering drills with such favorable results as to warrant its more extended use. The most serviceahle slack tuh I found to be a common five-gallon oil can, with the top left as a flap or cover to throw down and smother the flame in case the oil ignites from the hot steel. Provided the vessel is left open, this ignition, if it does happen, is very quiet, like that of coal tar, but with a partially closed tub or tank the accumulated gases are liable to introduce fireworks, as the writer can testify. There is really no necessity for an ignition of the oil, however, as the proper heat for plunging the steel—a bright red—is a little helow the point necessary to flash the oil.

It is a very rare thing for an oil-tempered drill to break, and they wear much hetter than water-tempered steel. With oil, the amateur will find no trouble in tempering steel to stand like an expert's work, as a slight variation in temperature does not effect such a change in the final condition of the steel as occurs in using water.

I do not use more than 5 inches of oil in the hottom of the can. The hotter the oil hecomes the hetter are the results. The consumption of oil is small, principally due to that portion sticking to the drills on withdrawal. Plunging them afterwards in loose dirt cleans them of this. BENJ. HASTINGS.

Chloride, Ariz., May 1.

Invert Foundations.

Written for the MINING AND SCIENTIFIC PRESS by C. H. FITCH.

The first of these will relate to road building—a much-threshed subject and a troublesome one, which stands hetween many a mine owner and the wealth he would like to realize. I propose to show an improved theory and method of making foundations for roads and structures of every kind, drawn from reasoning on very familiar and primary ideas.

The first of these takes us hack of the Copernican system to a conception of the earth as supported on the hack of a turtle, and that on a slab, and that on clouds of mystery. We very readily see that this old cosmic idea is ahsurd, but it is not a whit more ahsurd than it is to excavate to an indeterminate depth and lay down an immensely heavy hase course of solid rock, or grillage of iron beams at a point where the pressure is not the greatest, and not great enough to require this construction for the support of a huilding. It works, to he sure—increasing the load on the hase and putting needless weight and expense where it does not do the most good nor meet the most stress; hut it is a survival of the old turtle-hack idea, in which the turtle's hack was assumed to he strong enough, and no more questions asked.

Our second suggestion is furnished hy the familiar case of McAdam vs. Telford, which is usually stated hy prize essayists on roads without coming to any decision. But some engineers denounce McAdam as a quack and an empiric and extol Telford as the greatest road engineer since the Romans, who, by the way, had much to learn about economical construction of roads. The ideas of Telford were anticipated hy Tresagues, the French engineer, who built roads for the first Napoleon, the Simplon and other Alpine roads—roads that could be afforded by empire builders, hut would come rather high for most mines. Both of them are modelled after the foundations of buildings—a large, massive underpinning, on which a superstructure might rigidly rest. A Telford road is laid to a depth of a foot or two with as large stones as can be teamed upon it, on the hottom, where the pressure is less than on the surface. Telford was expensive; he was a trained engineer.

McAdam was a tenderfoot on roads, who was not technically trained, but did his own thinking. Mark Twain sought to erect a monument to the first Adam. The second Adam—McAdam—has monuments in all the roads after his idea and a souvenir in the name macadam, generally applied to hreccia or hroken stone of 1¼-inch to 2½-inch ring. Post roads under his charge were found kept in good order, while other post roads were mired and the mail riders delayed.

The pre-McAdamite idea was to fill the holes in dirt roads with more dirt. I know villages in which enough money has heen spent in a few years in such filling of dirt or small round gravel to suffice, if necessary, to pave the main street with cast iron.

McAdam's idea was, in one word, surface. For this reason people who can not cut loose from the old base-foundation idea say that he was a mender of roads rather than a road builder. His aim was to distribute the surface pressure, putting down a hlanketing of broken stone and making the surface of the smallest stuff, so that wheels would not get a lever-

Captain Vein, No. 9, 400 Level, Portland Mine, Victor, Colo.—(See Front Page.)

age on sizeable stones and loosen them up. This may do in moist England, hut here high winds in dry weather remove the surface dressing. Oil sprinkling helps to retain it and to shed surface water.

A third idea of foundation is afforded hy the turnip or beet, which has a hase analogous to that of a building, hut is tap-rooted rather than squared off at a definite point. A tree has to resist a lifting pressure, and its roots may find some analogy in the foundation bolts of machinery and the piles driven to support structures on unstable ground. If the ground be so soft that piles closely driven cause those previously placed to rise, the base is a kind of float constructed in a very extravagant way.

For a fourth idea we notice that nature, when she constructs a foundation on the unstable flood, builds from the surface, and in the thickness of a few inches of ice is able to support heavy loads over large areas. In the McAdam road the angular hroken stone composing the blanket locks together under pressure and distributes the pressure applied at a single point, as is done hy the springers of an arch, or, more properly, the elements of a dome. It does not require much thickness to sustain half a ton on a wheel rim, if the surface only he hard and unyielding. A surface as strong and continuous as ice on a hasis as substantial as dry earth would make a road in need of no further foundation. The trouble would he with abrasion—a surface difficulty to be met hy providing

as hard and continuous a trackway as can be afforded. The usual expedient would be to even up the ruts with broken stone filling and make the surface as hard, smooth and impervious to water as materials obtainable will permit.

In nature the tread of animals and men compacts the surface ground, kills vegetation and makes the trail. It serves its purpose, and, so far as it goes, the trail is built right from the surface. For heavier requirement, as of freight wagons, a broken-rock surface, heavily rolled, is an extension of the same idea of surfacing hard and compact at minimum cost. The heavy rolling or ramming of the surface is the road maker. It makes the refractory skin similar in resistance to wear and stress to the chill of molten forms.

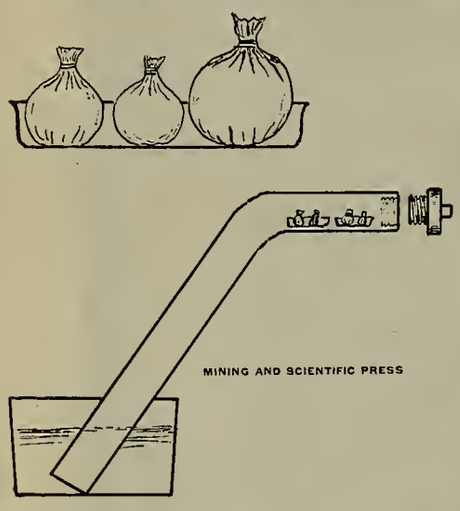
I have gone far afield for ideas already, but for the fifth suggestion I will go still farther and call attention to the parachute, which is steadied and sustained bearing quite a weight upon thin air. It is this domical form, rather than the heavy plug of granite or grillage of iron beams, which will render the greatest service in supporting the weight of high buildings or monuments.

Prospectors' Retort.

Written for the MINING AND SCIENTIFIC PRESS by F. RIGAUD.

For small quantities of amalgam, I tried, in Hungary, with complete success, the following simple apparatus·

The amalgam is put in a small piece of clean cloth, well pressed and tied by a thread; then the cloth is cut short as shown by the figure. With this precaution, the ball does not break up in calcination.



The balls of amalgam are placed in small pans made with a piece of thin sheet iron in order to keep them in place.

For a retort, I took a piece of iron pipe 6 feet long, 3 or 4 inches in diameter, bent at an angle of 135°, a foot from one end, which is closed by a screw plug. The short part of this pipe is placed level on the blacksmith's forge; the amalgam balls in their pans are put in the pipe and the cap screwed on. The other end of the pipe is put into water in a bucket, the quantity of water provided being too small to fill up the pipe when raised by vacuum.

A sufficient temperature is quickly obtained by blowing; the heavy vapors of mercury condense easily in the water. In a few minutes all the quicksilver is driven out of the amalgam, the cloth is burned to a white ash and there remains the golden balls of retorted amalgam ready for melting.

Fusible Plugs.

Fusible plugs have been used in boilers for a great many years, and the Government requires that all plugs used on boilers of steam vessels should be made of bronze and have no other filling but pure Banca tin stamped with the manufacturers' name, and that an affidavit setting forth this fact should be filed with the inspector having charge of the boiler inspection at whatever points the plugs are used.

INSIDE TYPE

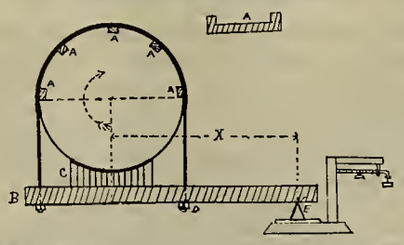
The Lunkenheimer Co. have manufactured fusible plugs for a number of years, all of which comply with these specifications, and, having made affidavit before the United States Steamboat Inspection Service to the effect that their plugs comply with these requirements, they are accepted by all inspectors throughout the United States.

Herewith is illustrated the inside pattern of plug, screwed in from the inside of the boiler. The Lunkenheimer Co. of Cincinnati, Ohio, will be pleased to give further particulars upon application.

Determination of Horse Power in Gas Engines.

By ALBERT STRITMATTER.

The method commonly used is by the pony brake, of which there are a number of varieties. The accompanying sketch shows one which is easily gotten



up. Several blocks of wood "A" are attached to a piece of leather belting. These blocks are made U-shaped to hold the belt on the pulley. One end of the belt is fastened to the beam "B" on which is a block "C." The other end of the belt is fastened to a bolt which extends through the beam "B" as shown. This bolt is threaded and a washer and nut "D" are placed on it. This is for the purpose of tightening the brake during the test. The beam "B" projects out from the pulley to a platform scale and rests on a knife-edged block "E." It is desirable that the beam be placed perfectly horizontal as the distance from the center of the crank shaft to the knife edge can be measured on the beam. If the test lasts for any length of time it will be necessary to have a stream of water play on the inside of the engine pulley, as it will get very hot from the friction.

In making a test of an engine for its maximum possible power it is necessary that the engine be in perfect adjustment, that the mixture of gas or gasoline and air be correct, and so on.

To make the test, start engine and gradually tighten the nut "D" until the engine is carrying its maximum load and yet maintains the normal speed. In four-cycle engines on full load the engine will take and explode a charge on every other revolution of the crank shaft. In a two-cycle engine it takes a change at every revolution. In the graduated charge or throttling type of four-cycle engine, a charge may be taken at every other revolution of the crank shaft, but the charge may not be put to its full size. On full load, however, the full sized charge is taken.

When the engine is at full load, balance the scales and ascertain what weight is shown. Also be sure that you know what the speed of the engine is. Measure the diameter of the pulley, also the diameter of "X" from the center of pulley or crank shaft to point of leverage on scales. Notice that this is not the distance from the center of shaft to point of leverage, but the horizontal distance between two vertical lines passing through the point of leverage and the center of crank.

There are several methods of figuring the horse power. One of these is to multiply the diameter of the pulley (in feet) by 3.1416. Then multiply this product by the distance "X" (in feet) divided by the radius of the pulley (in feet). Multiply this product by the number of revolutions per minute of the pulley and multiply the result by the net weight or pressure on the scale. Divide this product by 33,000 and the quotient is the brake horse power.

Another method is to multiply the net pressure on the scales by the length of the brake arm "X" and the product by the number of revolutions per minute. Then multiply this product by .0001904. The result is the brake or actual horse power.

These two methods are really the same and, with any one set of figures, will give the same result. They may be expressed algebraically as follows:

$$\frac{D N \frac{X}{R} N P}{33{,}000} = .0001904\ P \times N = B.\ H.\ P.$$

In these formulas D is the diameter of the pulley, R the radius, P the net pressure on the scales, N the number of revolutions per minute, and the length of the brake arm.

It will be noticed that the net pressure on the scales is to be used. This is not the pressure the scales actually show but the weight shown less that exerted on the scale by the unbalanced portion of the brake and the weight of the knife edge. Prof. E. W. Roberts, in his "Gas Engine Handbook," gives the following method for ascertaining the net weight of the brake: When engine is still, let a man stand on the scales and weigh him. Then ascertain the weight shown when he takes hold of the brake near the knife edge and pulls upward with a slight friction on the pulley. Then find the weight when he pushes down on the brake. The pressure due to the unbalanced portion of the brake is the difference between the weight of the man and half the sum of the weights when pulling up and pushing down on the brake.

It will now be understood why actual horse power is sometimes called the brake horse power; i. e., it is the amount of power delivered at the brake, or the amount shown by the brake test. It should be borne in mind that any test does not necessarily mean that the engine cannot develop more power, but only that it developed that much power at the time of the test, and any error made is more likely to be against than in favor of the engine.—American Manufacturer.

Origin of Ore Concentration in America.

The subject of concentration yearly becoming more important as improvements are made in machines and methods, it will be interesting to go back to the origin. I suppose the "golden fleece," really a sheep pelt, anchored in the auriferous sands of a river bed, is about the oldest device of record. Then we find that in A. D. 1571 Pedro Fernandez de Velasco, in Peru, performed a rude concentration of silver ore upon a hide (laid upon a sloping bank), upon which the pulverized ore was spread by throwing water thereupon in such manner and quantities that the lighter gangue was washed down and off the lower edge, while the heavier, more valuable particles were caught and retained by the hair thereon, to be recovered by a subsequent washing. This method is still in use in Mexico, the peon substituting a piece of canvas for the hide.

The first concentrators to be used in a mill in the United States, as the writer believes, were in the mill of Bouton & Uznay in 1863. Captain Uznay, a compatriot of Kossuth, being banished from his native land, settled in the then Territory of Nevada, and, associating himself with A. P. Bouton, they erected a 20-stamp mill in Gold canyon, just below Silver City. Finding the Hungarian bowls, used by them to amalgamate Comstock ore, unsatisfactory, Captain Uznay (probably copying some Hungarian device) designed a bumping table, of which the following is an accurate description:

Two 2-inch planks, 12 inches wide and 16 feet long, were fashioned like sled runners, set 4 feet apart and floored across the bottom with 2x8-inch stuff. A piece of 4x4 was spiked on underneath this floor along its longitudinal center (like the keel of a vessel), and projecting at the front, or curved end, about 2 feet. This keel was reinforced at the front end with 4-inch stuff up to a level with the top of the front end and side pieces and secured by bolts therethrough. A heavy sub-frame, with four corner posts and caps to which this big table was hung, carried a heavy bumping block at one end, to which the above keel was held in contact by the gravity of the table, due to the inclination of the hangers. This huge table was alternately pushed away from the bumper block by a cam having a throw of about 15 inches and allowed to swing back to a violent and rebounding contact when released by the cam. The pulp was fed across this table about 5 or 6 feet from its head through holes in the bottom of a cross-box, and dressing water was supplied at the head through a similar but smaller box. A man with a broom and a square-pointed shovel was kept busy attending to two of these tables. His duties were to sweep the bed of the table crossways so as to keep the material evenly distributed and to remove the concentrates as they accumulated, with the shovel. They made a good concentrate, which was worked by the patio method by Mexicans; but the less said about the tailings the better. This device was at that time considered a wonder, and is undoubtedly the parent, if not the grandparent, of the justly celebrated "Gilpin county bumper."—W. L. Card in Denver Post.

Platinum Mining in British Columbia.

Consul L. E. Dudley writes from Vancouver: "Platinum has long been mined in the Similkameen, about 150 miles east of Vancouver. It is said that Chinamen have been earning living wages for the past fifteen years by recovering platinum from the placer deposits of the Tulameen river, and also of Granite creek. Local newspapers announce that the Slate Creek Hydraulic Co. has been formed to develop the platinum claims in that vicinity. It is understood that a considerable amount of capital is interested in it, largely from the city of Seattle, Wash. It is proposed to work a tract of 320 acres on Slate creek. Slate creek is just over the divide of the Similkameen river, on the Washington side, but operations will be extended into British Columbia territory also.

"The fact that the creeks in this region have been producing platinum will doubtless lead others to begin prospecting. The proportion of precious metals in the gravel, as shown by hundreds of assays made by the Slate Creek Hydraulic Co., is about two-thirds gold to one-third coarse platinum. Some of the nuggets are as large as the little finger of a man's hand. The gravel runs 25 cents to the yard in platinum and gold. It is believed, however, that somewhere in the 220 acres of the company's claim, the old bed of the creek will be crossed and that richer gravel will then be found.

"Another deposit of platinum is also said to have been discovered in Kennedy mountain, near Princeton, B. C. Samples of the gravel have been sent for assay."

The Golden Gate Cyanide Plant.*

This is the oldest cyanide mill in the district, and is known as the Rossiter, the First Ward or the Deadwood cyanide mill. The mill was erected in 1892 as a cyanide mill, but was never in continuous operation, although a great deal of ore has been treated there. Since its construction no radical changes have been made in the mill, except to increase its capacity, and in consequence it represents the past type of mill. It is a dry-crushing mill, having facilities for drying and roasting the ore. Roasting, however, as far as the writer's information goes, has not been used of late.

NATURE OF THE ORE TREATED.—The ore comes from the Bald Mountain district and is in part oxidized and in part non-oxidized. The latter is commonly known as "blue ore." Both kinds are highly siliceous, the unoxidized being a hard, blue siliceous ore, very dense, carrying a small percentage—2% to 6%—of finely disseminated pyrites. The oxidized ore is more or less porous and of a somewhat shaly nature. The blue ore is much more difficult to cyanide than the oxidized ore, and, as both come from the same mine, mixtures of the two are not always avoidable. The two classes of ore are best treated separately, in order to get the best results. The extraction on blue ore is low. The ore ranges in value from $10 to $30 per ton, the average being $12 to $15.

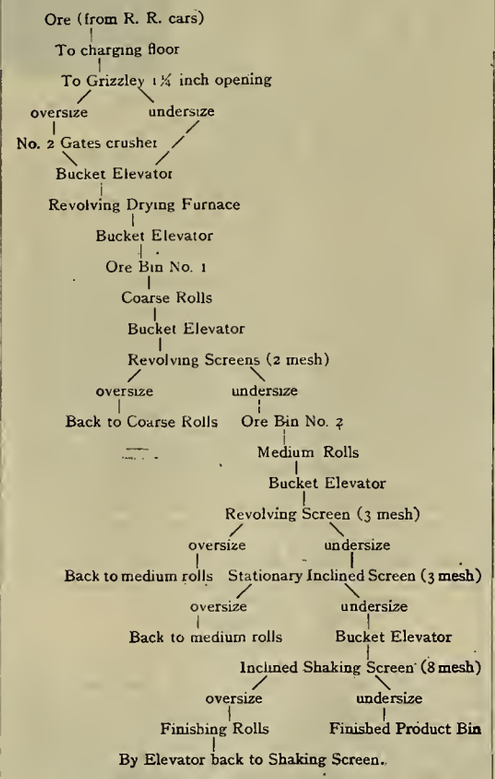
THE CRUSHING OF THE ORE.—The situation of the mill site is not very favorable as regards slope, and hence the crushing department has of necessity a considerable number of elevators, as shown in the scheme of crushing. As the mill is a dry-crushing mill, provision is made to collect as much dust as possible. All the rolls, elevators and screens are connected by rectangular wooden flues, with a 55-inch Sturtevant fan. The dust collected by the fan is discharged into collecting bin No. 1 through a rectangular horizontal flue. In this first bin the coarser dust settles, while the finer material is blown out through another rectangular horizontal flue into the bin No. 2, where more material settles. The finer dust which escapes from bin No. 2 passes through a long wooden flue, 100 feet long, situated on the roof of the main mill building, into a large dust chamber provided with an exhaust stack. The dust collected amounts to $\frac{1}{12}$ to $\frac{1}{15}$, or 7% to 9% of the amount of ore crushed. The material thus collected contains nothing coarser than what will pass through a 120-mesh sieve. A diagramatic sketch of the dust-catching apparatus is shown. Bins Nos. 1 and 2 are cylindrical, 8 feet in diameter and made of boiler iron.

* Bulletin No. 5, South Dakota School of Mines.

CRUSHING AND SCREENING MACHINERY.—Grizzly is short, 3 feet long, and spaces between bars are 1¼ inch.

The rough crushing is done in a Gates No. 2 gyratory crusher, crushing to a 1½-inch ring. The capacity of this crusher is sixty-five tons per twenty-four hours when running on dry ores and but about thirty tons when running on wet ore. The other crushing machinery of the mill has a capacity of about 100 tons per twenty-four hours, but the mill is limited to sixty-five tons by its tankage and rough crusher.

The following diagram is illustrative of the crushing:



ROLLS.—There are five sets of rolls in the mill. One pair of Gates rolls for coarse crushing and one pair of Gates and one pair of Bowers rolls for the medium crushing. The Gates rolls are at present crushing all the ore, the Bowers being out of use. There are two pairs of Gates rolls for fine crushing.

The coarse crushing rolls are 26 inches in diameter and 16-inch face; rolled steel shells 4 inches thick are used, and the last set wore for twelve months. The speed of these rolls is ninety revolutions per minute.

The rolls for medium crushing are 26 inches in diameter and 12-inch face. The speed of the rolls is 120 revolutions per minute.

The rolls for fine crushing have the same size and speed as the medium crushing rolls.

The size of the Bowers rolls, which are not in use, is: Diameter, 26 inches; face, 14 inches.

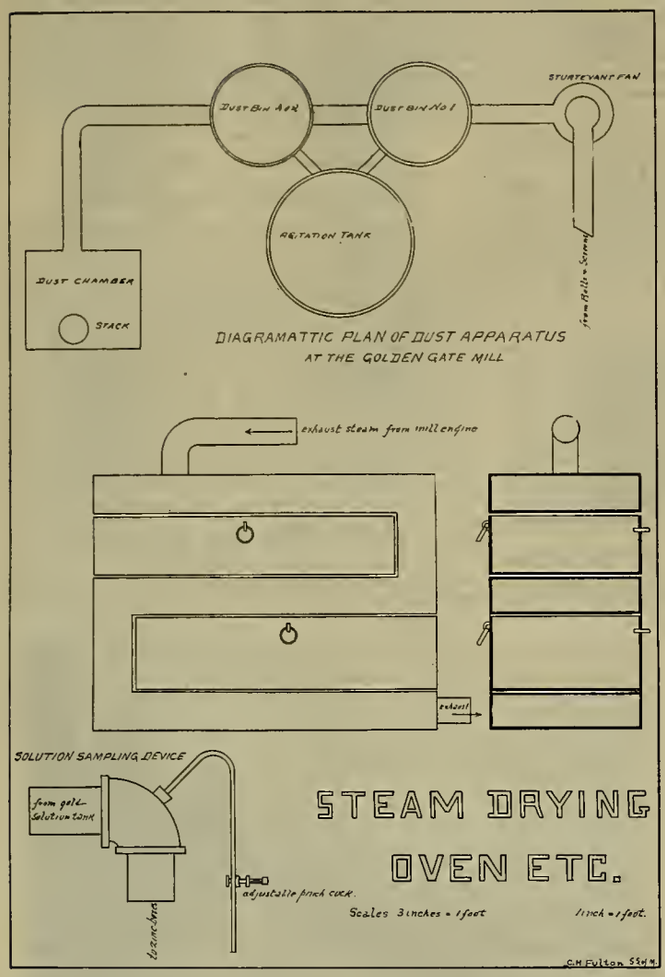
REVOLVING SCREENS.—The revolving screens, of which there are two, screen the ore as it comes from the coarse rolls and are 7 feet long and 3 feet in diameter. The screening surface is a 2-mesh wire cloth, four openings per square inch.

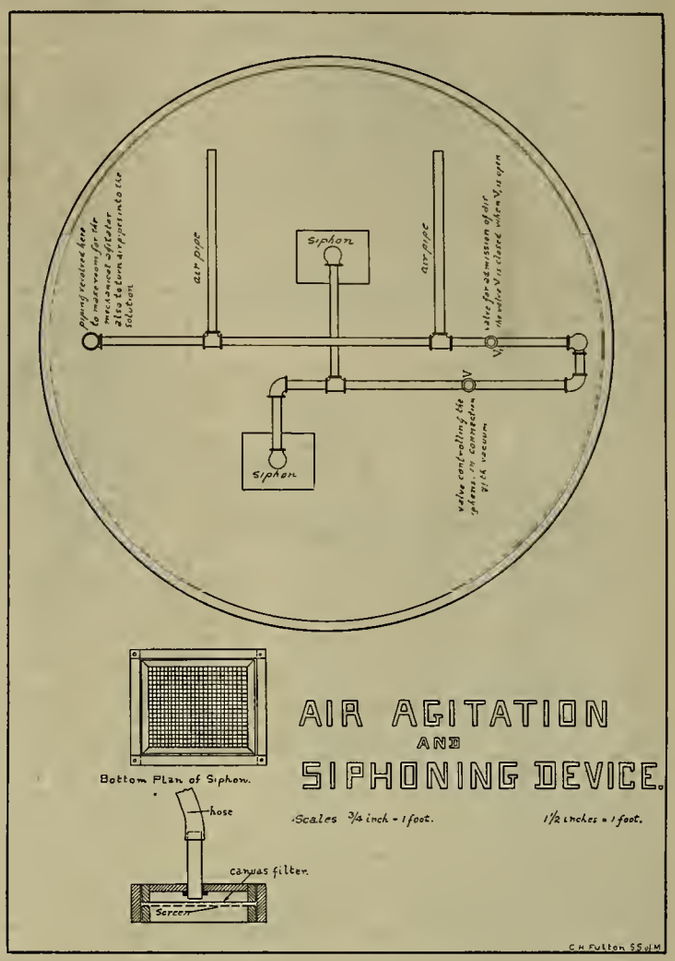
The revolving screens which take the material from the medium rolls are also 7 feet long and 3 feet in diameter. The screening surface is 3-mesh wire cloth, nine openings per square inch.

The two screens which take the material from the fine rolls are shaking screens. These are built double, each single screen having an area of 16 square feet, making 64 square feet for the two double screens. These screens are inclined at 45° and make 168 vibrations per minute. The power is transmitted to the screens by chain and sprocket. The screening surface is 8 mesh, No. 16 wire, sixty-four openings per square inch. As these are the finishing screens, they determine the size of the ore cyanided. It has already been stated that the dust apparatus takes out everything above 120 mesh, so that the material cyanided ranges between 8 and 120 mesh. There is probably only a small portion, however, as coarse as 8 mesh, for the reason that the finishing screen, being an inclined flat screen, most of the material as coarse as this is carried back to the fine rolls for recrushing.

There is also a stationary inclined screen (3 mesh) placed in connection with the revolving screens of the medium crushing rolls, as may be seen by referring to the scheme of crushing. Its utility is doubtful. It could be done away with by having a finer mesh in the revolving screens. It will also be noticed that the material from the medium rolls undergoes a triple screening: First, by revolving screen; second, by stationary inclined screen, and, third, by the inclined shaking screens. This relieves the finishing or fine rolls very much.

THE DRIER.—This is a long, cylindrical furnace of





the White-Howell type, 30 feet long and 5 feet in diameter, which, with ore carrying considerable moisture, has a capacity of 100 tons per twenty-four hours. With an ordinary percentage of moisture, it makes one revolution in thirty-five seconds and consumes 1½ to 2 cords of wood (pine) for sixty to sixty-five tons of ore.

LEACHING DEPARTMENT OF THE MILL.—There are six leaching vats, three in a row, built of steel, 24 feet in diameter and 36 inches deep, holding fifty tons of dry ore. There are no bottom or side discharge gates, the tailings being shoveled out over the sides into cars. The tanks have the usual slat bottom, the filter consisting of a layer of cocoa matting, burlap, and another cocoa matting on top of this. The top matting protects the burlap, which is the real filter. The top cocoa matting lasts about two and a half years without any renewal. The actual leaching depth of the vats is 32½ inches, deducting from this about 1½ inch, the ore not coming flush with the top, the depth of ore is 31 inches; evidently a very shallow vat. These vats have been in use for six years.

The two gold solution tanks are 10 feet in diameter and 6 feet deep, built of steel, and placed just above the zinc boxes. The two sump tanks are the same size as the gold tanks and situated below the floor, under the zinc boxes.

The strong and weak solution tanks, or distributing tanks, are also of steel, 10 feet in diameter and 8 feet deep, and placed at the head and above the leaching vats.

The solutions as they come from the leaching vats are very clear, and, owing to the shallow depth of the vats, the leaching is very rapid; in fact, so rapid that it must at times be checked by the valves, in order to maintain the proper rate of flow through the zinc boxes, and also keep the solution sufficiently long in contact with the ore pulp.

The pipes which carry the solution to the tanks are 2½-inch pipes. The discharge pipes from the filters are 3-inch pipes. The piping is arranged in the usual way, so that strong and weak solution can be run into the respective zinc boxes.

The mill is also provided with a vacuum filter arrangement, but that is not at present in use except to drain tanks of moisture, as the leaching, if anything, is too rapid. The air pump is used to furnish air for the treatment of the dust, as will be described under the heading "Dust Treatment."

ZINC BOXES.—There are two zinc boxes—one for "strong" solution and one for weak solution. The boxes are 10½ feet long, 30 inches wide, and have a depth of zinc of 24 inches. The box is divided into nine compartments, the last two of which do not contain any zinc, but serve to settle any fines before discharging into the sump tanks. The boxes are provided with inclined bottoms and a side launder to facilitate the clean-up.

The fine precipitates are washed into a round, steel filter tank, 3 feet in diameter, provided with a heavy canvas filter and connected with the vacuum pump. All of the finer portion of the precipitates are thoroughly washed in this tank before being transferred to the acid tank.

CYANIDING OF THE ORES.—The vats are charged by end-dump steel cars, holding about 1200 to 1500 pounds of crushed ore. The tracks run close to the side of each row of vats and at a level with their top. The cars are charged from the finished-product bin by the usual chute. A change has recently been adopted in charging the cars, necessitated by the fact that it was found advisable to wet the ore with cyanide solution before charging into the vats. This is done by letting a carful of ore flow out on a platform in front of the chute, then moistening it with cyanide solution, shovelling it over, then transferring it to the cars and then into the vats. The amount of cyanide solution used is just enough to thoroughly moisten the ore. Its strength is ¼%, or five pounds of potassium cyanide per ton of solution. The moistened ore is allowed to stand only a short time, until the car comes back for the next load; but repeated tests have shown that in time about 40% of the gold goes into solution. As the ore is dumped from the cars into the vats, it is raked down by men standing in the vats. When conditions are favorable it takes about sixteen hours to charge a vat, two men and one car being employed in the work.

The strong solution is then turned on, the vats being filled from the top, and allowed to stand for about twenty-four hours, although this is sometimes varied. The strength of this solution is five pounds of cyanide per ton. This solution is then circulated for some time and then replaced by a weak solution containing 2½ pounds of cyanide per ton of solution. This is not allowed to stand, but is continuously circulated. The total amount of weak and strong solution that is used on the ore is from fifty to sixty tons, the relative amount of weak and strong solution differing with the class of ore. The average rate of leaching is about three tons of solution per hour. The weak solution is finally displaced by eight to ten tons of wash water per vat, the ore being dried as far as possible by the use of vacuum, to draw off as much moisture as possible. The amount of moisture in the tailings after the application of the vacuum pump is about 8% to 10%. (?)

The time of leaching and washing is generally about ninety-six hours. Vats are usually discharged in twelve hours, the tailings being shoveled out over the side into cars, the total time required for one vat thus being 124 to 140 hours.

Slacked lime is used to neutralize the acidity of the ore, eight pounds per ton being added. This is added in proper quantity at suitable intervals to the finishing rolls, thus insuring a very fair mixture of ore and lime.

The aim is to have a "protective alkalinity" of about 2 2 pounds of lime per ton of solution. The protective alkalinity is that part of the alkalinity of the solution not due to the potassium cyanide or other cyanide salts. It is usually expressed in pounds of alkali per ton of solution.

The consumption of cyanide is about three-fourths of a pound per ton of ore, and the actual extraction of values, or the saving, is about 79% to 80%.

The rate of flow of the solution through the zinc boxes is one ton per hour for the strong solution and three-fifths of a ton per hour for the weak solution. The precipitation is very good, no trouble being met with in the zinc boxes, the solution issuing from the boxes rarely running more than 4 cents to 20 cents per ton of solution.

DUST TREATMENT.—The dust or fines from the crushing, which, as already stated, amount to from 7% to 9% of the material crushed, is treated separately by agitation in a tank provided with mechanical stirring apparatus. The agitation tank is of steel, 10 feet in diameter and 56 inches deep. The agitator is a central steel shaft 2½ inches in diameter, provided at the bottom with two horizontal arms and driven at top by bevel gear. The agitator can be lifted out of the tank by means of pulley and chain. The usual speed of the agitator is twelve revolutions per minute.

In treating the dust the tank is first filled with ten tons of strong solution, five pounds of cyanide per ton, and then eight tons of dust are added by means of a movable 6-inch galvanized iron pipe provided with a conical hood at the end. This hood dips beneath the solution, preventing dust. The charging pipe leads from the dust bins, which are immediately above the agitator tank, and have already been mentioned. The agitator is set in motion at the beginning of the dust charging and the mass is agitated for six hours. Then air is pumped through for an hour, the air being furnished by the reversal of the vacuum pump. This first treatment with strong solution by agitation and aeration gives an extraction of about 50% of the values. The treatment with strong solution is followed by four treatments with weak solution, containing from 1 to 2½ pounds of cyanide per ton. The treatments with weak solution are identical with the treatment with strong solution, except time consumed, which is agitation for half an hour and aeration for one hour. After the aeration the slimes are allowed to settle for twelve hours, and the supernatant solution, amounting to about 60%, is syphoned off, the syphon being a square wooden box provided with canvas filter and started by the vacuum. (See drawing for apparatus for syphoning and agitation.) The solution which is drawn off is passed again through a canvas filter, which is a long, inclined launder-like box, in which a horizontal sheet of heavy canvas is stretched, the solution entering beneath the canvas and being forced up through it. This effectually clears the solution of all suspended matter and leaves it in condition to enter the zinc boxes. By these successive treatments an actual extraction of 85% to 86% is finally obtained. The slimes are washed with one lot of wash water, which solution is discarded if it does not run over 40 cents per ton. The total amount of time consumed in treating a tank of dust is generally about seventy-two hours, sometimes more, up to 120 hours, depending on the nature of the ore the mill is treating. It is interesting to note that the dust has a higher value than the ore from which it originates, and that the extraction is 5% to 6% above that made on the sands, or the coarser material treated in the large vats; also, that the time of treatment is considerably shorter by more than a day.

(TO BE CONTINUED.)

THE average cost of petroleum wells at Baku, Russia, is now conceded to be not less than 60,000 rubles (about $30,900). The Baku man's machinery and rig ready for drilling costs much more than the average American well completed. In the Baku fields, to get to a depth of 1500 feet, they start with not less than a 26-inch hole, and in deeper territory with even larger holes up to 32 inches in diameter. The pipe used is ⅜-inch iron riveted, in 4-foot joints, which are joined by riveting. The practice is to drill ahead of the pipe and then drive it, and they continue driving the first pipe until it collapses or for some reason will go no farther; then they start another string of a diameter which will go inside the first, generally 2 inches less; and when this can be no longer driven, then another string inside it, and so on until they strike the oil. In deep wells, there is sometimes more than $10,000 worth of pipe. Then the cost of drilling by contract is generally made at about $5 per foot up to 700 feet, the price increasing about 75 cents per foot for the next 70 feet, $1.50 for the next 70 feet and so on till after 900 feet the price is about $7.50 per foot. Thus, a 1500-foot well will cost nearly $10,000 for drilling.

The Josephine Mine, at Volcanoville, Cal.

Written for the MINING AND SCIENTIFIC PRESS.

The northern portion of the mother lode system of veins enters El Dorado county, Cal., on its southern border at Nashville, and extending thence nearly due north is strongly developed and readily locatable near Placerville and thence northward to the vicinity of Kelsey. Here the Mariposa slates, a characteristic rock formation associated with the mother lode, turns northwest and is traceable by the lode system that accompanies it, one branch of the mother lode, at Greenwood and into Placer county at Butcher Ranch. The intrusive eruptive rocks, so closely associated with the pay ore bodies of the mother lode to the southward, at Kelsey hold to the direct north course of the lode, and are accompanied by a system of lodes passing by Georgetown, Volcanoville and into Placer county, are strongly developed at Bath and Forest Hill. The Josephine mine is located on the eastern contact of these eruptives with the metamorphic rocks, at Volcanoville, on the northern line of El Dorado county. Both branches of the mother lode system have proven notably rich feeders to the placer deposits and many quartz mines have been exploited on them in El Dorado county.

Mine Buildings No. 3 Tunnel, Josephine Mine, Volcanoville, Cal.

The Josephine mine lode seems to have from its erosion fed the early-day placers of Volcanoville and contributed to the enrichment of the Middle Fork of the American river in its richest section. The lode was mined in the early '50s and more or less continuously since until the 20-stamp mill was destroyed by fire about ten years ago.

The present owner of the property, the San Francisco M. Co., J. M. Nouges, Jr., Supt., is now reopening the mine. The view given herewith shows the mine buildings at No. 3 tunnel in the canyon of the Middle Fork of the American river.

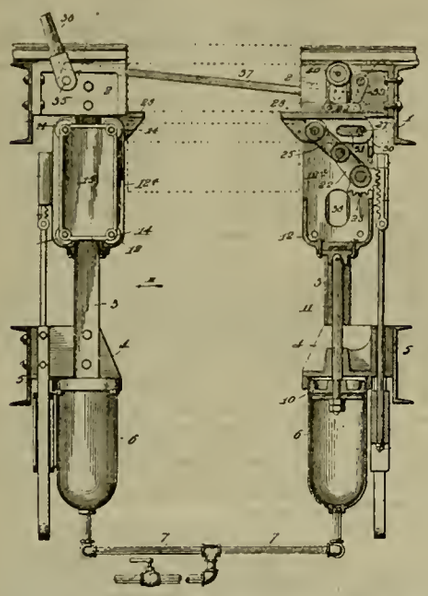
Tunnel No. 3 has been reopened a distance of 320 feet, tunnel No. 4 a distance of 1020 feet, and tunnel No. 5, a new tunnel, at a perpendicular depth of 1000 feet down from the summit at Volcanoville, has been driven nearly 600 feet, and work is being continued in it. There has been encountered in this tunnel, one ledge 11 feet wide and another 6 feet wide, both carrying pay values. A tunnel which has been projected along the ledge, beginning at the bottom of the canyon near the river where the new mill is to be located, will open this property about 2100 feet in depth. The water flowing from tunnel No. 3 is carried in a V flume and pipe, and, joined with the water from tunnel No. 4, enters a pipe line and is used under 600 feet head on a water wheel which provides power for tunnel No. 5. Power drills have been installed and it is proposed to use a water right on the Middle Fork of the American river to furnish water power for a mill and large air compressor.

Mining and Metallurgical Patents.

Patents Issued May 5, 1902.

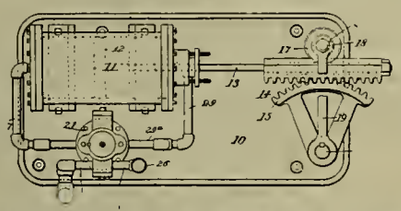
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

CHAIR FOR MINE CAGES.—No. 699,135; J. O. Bardill, St. Louis, Mo.



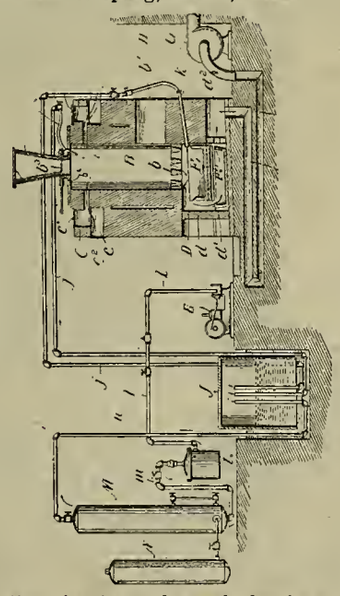
Dog-supporting means, dogs carried thereby, pressure receiving cylinders, piston rods connected to dog-carrying means and extending through cylinders, pistons on rods, racks carried by piston rods at their lower ends, spur wheels arranged in engagement with racks on pair of shafts by which spur wheels are carried, and third shaft geared to two first-named shafts.

HYDRAULIC GOVERNOR FOR WATER WHEELS.—No. 699,142; W. J. Bridger, Phœnix Mills, N. Y.



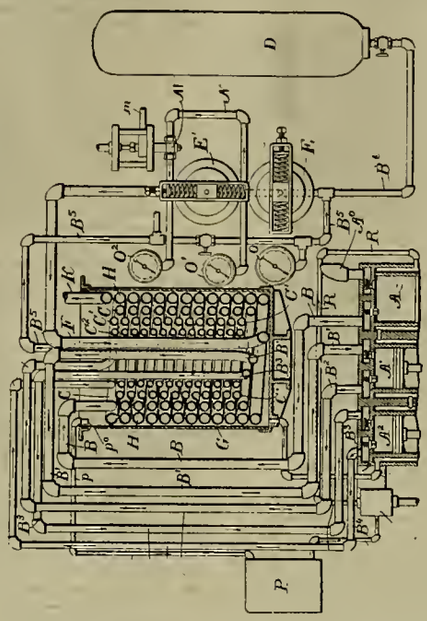
Pressure cylinder, gate shaft operatively connected with cylinder for regulating water supply, valve cylinder communicating therewith, longitudinally movable valve in valve cylinder provided with openings to form ports and having its stem slotted longitudinally and perforated transversely of slot, casing secured to stem provided with angle slot, spring-pressed pin within casing in position to enter perforation of stem, pin projecting through angular slot for moving first-mentioned pin, and governor provided with perforated stem within slot of valve stem and adapted to be locked against longitudinal movement therein by spring-pressed pin.

APPARATUS FOR TREATING ORES.—No. 699,457; A. M. Dorr and J. Spang, Boston, Mass.



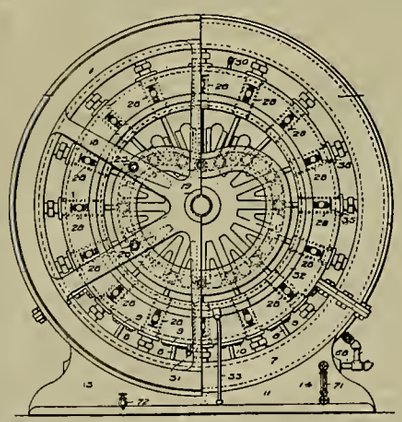
Reduction chamber; charcoal chambers C communicating with upper portion of reduction chamber; matte chamber below reduction chamber; molten metal receiver in matte chamber; means for creating and maintaining downdraft in furnace, downward through reduction chamber thence down, into and through matte chamber and around receiver therein, and thence out from furnace, and means for introducing gas into both reduction chamber and matte chamber.

AIR COMPRESSOR AND INTERCOOLER.—No. 699,288; W. B. Cowles, Cleveland, Ohio.



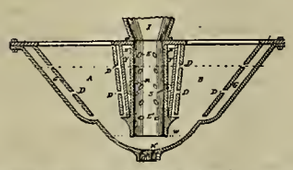
Tank, reservoir for compressed air, means for supplying compressed air to reservoir including compressor cylinder with water jacket, cooling coil in tank, and means for carrying off compressed air comprising pipe, two reducing valves, in pipe, by-pass for one reducing valve, means for controlling by-pass by hand, heating coil located in tank, fluid pressure main receiving air from heating coil, and means for circulating water through tank and jacket.

AIR COMPRESSOR.—No. 699,570; G. W. Rhine, Altoona, Pa.



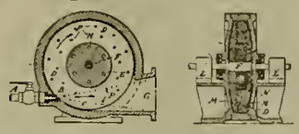
Stationary disk having central hub, revoluble shaft extending loosely through hub, wheels fixed upon shaft one at each side of disk, grooved cams carried by wheels, annular water casing surrounding disk and secured thereto, pipes for supplying water to casing, series of air pumps arranged radially in pairs within water casing, rollers mounted on piston rods of pumps and extending into grooves of cams, and annular air chamber surrounding water casing into which all pumps deliver air.

AMALGAMATOR.—No. 699,550; J. McKelvey, Louisville, Ky.



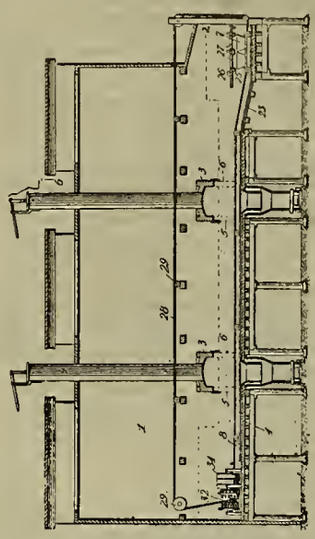
Case having mercury holding basin, provided with means for withdrawing amalgam therefrom, also having outer chambers, intermediate chamber and separate chamber having openings leading to outer and intermediate chambers, and means through which water under pressure is admitted to separate chamber, sluice tube in intermediate chamber, having series of downwardly inclined apertures for admission of water from intermediate chamber, apertures near lower end of tube extending through wall of same at angle nearer horizontal than those above, and overflow pipes in outer chambers, having non-radial apertures in their walls for admission of water from their respective chambers, tube and pipes having communication with basin.

TURBINE.—No. 699,636; E. C. Thrupp, Walton-upon-Thames, England.



Shaft, number of flat circular disks spaced apart on shaft and means for forcing liquid in straight line between disks, whereby disks and shafts are caused to revolve by friction of liquid on sides of disks.

FURNACE CHARGING SYSTEM.—No. 699,525; A. B. W. Hodges, Grand Forks, Canada.



Furnace, charge carrier having plurality of compartments, combined dumping area of which approximately equals cross sectional area of furnace, means for moving carrier, and charge distributing means occupying location above carrier when in position to be charged, charge distributing means being constructed to effect distribution of charge in carrier in conformity with position to be occupied thereby in furnace.

PROCESS OF REDUCING METALS AND PRODUCING ALLOYS THEREOF.—No. 699,282; H. S. Blackmore, Mt. Vernon, N. Y.

Process of reducing metals by exposing a composition therefor to be reduced containing metal and two or more non-metallic elements to action of heat and metallic carbide, combined elements of which are capable of combining with electro-negative constituents of compound.

EXTRACTION OF COPPER BY THE WET METHOD.—No. 699,326; T. A. Irvine, Hornsey, England.

Process for extraction of copper consisting in treatment of ore within mixed solution of chloride of sodium and sulphuric acid in which solution there is excess by weight of chloride of sodium in respect to sulphuric acid.

GASH VEINS twenty-five years ago furnished an excuse for many a mine failure. Now such a thing is seldom mentioned. The theory was that such a vein was a crack in the earth's surface which closed together with depth. A pinch in a vein cutting off the ore made it a "gash" vein to the old miners and led to its condemnation. In fact, the old miners were not particular about the pinch being there. If the ore failed to pay, it was the same thing to them, and "gash" vein covered it up. Later, when more persistent mining went on downward and laterally, the pinches were passed or pay ore came in again. Now, it is realized that the bottom of a vein has never been found, though the lateral extent has limits.

THE cost of attendance of water-power plants is less than that of steam or other plants, and, on account of the absence of a fuel bill, the operating expense is very small; but, on the other hand, the first cost may be very large, and therefore make fixed charges correspondingly greater than with other kinds of plants. The depreciation and repair bill is less than in the case of steam, an allowance of 4% usually being considered ample to cover these items, while the corresponding allowance for a steam or gas engine plant is 10% to 15%.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

KETCHIKAN.

A Tacoma, Wash., company, headed by A. C. Little of Tacoma, has secured a deposit of gypsum on Freshwater bay and proposes to construct a refining plant at Tacoma to cost $20,000. The gypsum ledge which has been uncovered is 70 feet wide for 1000 feet in length. A tramway 3500 feet long is being built to convey the mineral from the quarries to barges, upon which it will be transported to Tacoma. The factory will be planned to work up 15,000 to 20,000 tons of gypsum yearly into plaster of Paris and fertilizers.

VALDEZ.

A report has come to Valdez from the head of the Tanana river that a 500-foot ledge of very rich copper ore has been discovered in that section, A. B. Iles of Valdez owning the discovery. According to his report, the copper deposits of the Tanana promise to compare with the copper deposits on the Chittyna river. The place of the discovery is located in the Nutzotin mountains, northwest of the head of Tanana, and between that stream and the head of the Nabesna river. This copper belt is about 40 miles long and is thought to be a continuation of the deposits on Kletsan creek, near the head of the White river. The summer route to the Tanana copper country is by way of the government trail from Valdez to the mouth of the Chistuchina, then up the Copper river to Batzulneta, an Indian village, located on a creek of the same name tributary to the Copper river. From that point there are several trails across the divide to the Tanana waters. It is not a hard divide to cross, being low and timbered most of the way.

Work on the Moon Shine group of quartz claims at Ellamar is being done under Supt. F. Nelson. A tunnel is in 74 feet and has struck the lode, developing a good body of ore 3 feet wide. Samples assay from 12% to 30% in copper and from $4 to $12 in gold. W. D. Heidhorn of Valdez is the owner.

YUKON.

At a mass meeting of the miners and citizens held at Circle City resolutions were adopted strongly favoring the passage of Congressman Cushman's bill doing away with mining locations by power of attorney.

ARIZONA.

COCHISE COUNTY.

The Commonwealth M. Co., headed by R. A. F. Penrose and D. M. Barringer of Philadelphia, Pa., is reported to have bought the Casey copper group near Dos Cabezas and other properties along the probable line of a branch railway to be built by the Southern Pacific to the Commonwealth mine.

The Eureka M. & M. Co. at Hartford, south of Bisbee, has recently struck a large body of rich ore in shaft No. 5, which it is claimed runs over $200 per ton, while the mill ore averages about $30.

A Los Angeles, Cal., company has been incorporated to work a group of placer claims near Dos Cabezas by F. K. Rule and others. They have bought 520 acres and will put in water and machinery. F. K. Rule is president of the company.

GILA COUNTY.

G. Lobb has bonded his mine near Silver King to A. C. Sieboth of Globe. It is a gold property, on which 2500 feet of development work has been done.

At the Old Dominion works at Globe a briquetting machine is being installed to utilize the flue dust. Other minor changes at the smelter are contemplated.

It is reported that the Grand Prize Copper Co. will shortly resume operations on the Cracker Jack mine, near Payson, also that work is to be started on the Tonto Chief mine, owned in Jerome. It is claimed a custom mill could be kept employed at Payson.

GRAHAM COUNTY.

In the manufacture of gas by the Detroit Copper Co. at Morenci there are two generators, which, when put into blast, are fed with bituminous coal, from which the gas is made. Through these generators air and steam are passed in a downward current, the steam being generated by passing the hot gas through a tubular boiler, from which it is returned to the generators mixed with air. The gas from the generators goes through scrubbers, which free it from carbonic acid, soot and other impurities. It is then passed into the holder, from which it is drawn as needed to supply the various departments with power. The capacity of the plant is over 2,000,000 feet per day. The cost at the plant of each horse power generated by gas as compared with steam is about as one is to four, but when the added cost of freight and transfer is reckoned it reduces the rates in favor of gas.

J. Molder, Supt. of the Home Copper Co.'s mines, near Morenci, states that the mine shows a quartz lead 12 feet wide which will average $17 in gold and silver.

The Shannon smelter at Clifton is now running and shipments of copper have been commenced. The plans for converter and concentrating plants are nearing completion, after which work will be commenced on them.

J. Colquhoun, who retired as general manager of the Arizona Copper Co. at Clifton, May 1, at a farewell meeting with the heads of the various departments, in speaking of the many improvements made on the property during the past two years, stated that owing to the energy and intelligence of his mechanics the company had been able to construct concentrating plants and erect smelters in less time than they had ever before been erected in any country within his knowledge. He said that the company is now treating lower grade ores at a better profit than any other company in the United States, which he attributed mainly to the capacity of the men under his employ. Since the erection of the new smelting plant the output of the company had jumped from 10,000 tons annually to 15,000 tons, and this would be greatly increased as soon as the new reverheratory furnaces were completed, which would be in a short time.

The Home Copper Co. has struck a large body of gold and silver ore on their property just west of Morenci, which averages over $16 to the ton. The company is considering the question of putting up a mill in order to work the ore.

MARICOPA COUNTY.

The gold strike made by Scott, Gilbert & Rowe in the White Picacho district, 12 miles east of Hot Springs Junction, is a ledge 60 feet wide, averaging, it is claimed, about $5 to $6 a ton. Two 50-foot prospect shafts are being put down.

MOHAVE COUNTY.

I. C. Conkey of Mineral Park and F. Harter of Kingman have relocated the old Lone Star mine at Mineral Park. It was thought that the mine was patented, an application having been made twenty years ago, but, it seems, was never completed, owing to a defect in the title. Mr. Conkey states that there are 4 feet of $70 ore in sight in the mine, and men will be put to work at once and shipments made.

Mrs. J. Kay of Kingman is having a drift run on the Setting Sun vein, at Mineral Park, in which recently a body of almost black copper, carrying values in gold and silver, was struck.

J. Barry has taken over the Cerbat mine, at Cerbat, after extended litigation for several years. In the early days of the district the mine yielded largely.

PINAL COUNTY.

P. C. Robertson of Globe has bought some copper mining locations near Reymert. The ledges are quite large and the surface ore is rich in copper and carries some silver.

J. W. Cope of Illinois, Recorder McFall of Maricopa county and W. H. Ream of Phœnix have been examining the Specie Pay and other mining claims near Florence with a view to determining the advisability of installing a smelting plant there.

YAVAPAI COUNTY.

C. M. Gorin, owner of the Hidden Treasure mine, Black Canyon district, near Prescott, has sold six tons of ore for $138 a ton at the sampling works. The ore shoot in the Hidden Treasure ranges from 1 to 2½ feet in width. The property has 700 feet of development work. One shaft is 175 feet deep.

Nathan & Cleator has made a strike of free gold ore carrying some silver and lead, in a shaft down 20 feet on a 2-foot vein. The ore goes about $150 a ton. Their mine is near Prescott.

At the Model, near Kirkland, the shaft is down 300 feet deep and has drifts extending 100 feet each way. It is stated that the ore body is 4 feet wide and that the ore ranges in value from $150 to $500 gold per ton. President F. Jager has bought for the Model M. Co. the Alta, Batchelor and Wolftone gold claims for, it is reported, $150,000. L. W. Felt is general manager of the company.

C. L. Baker, manager of the Monarch G. & C. M. Co., near Jerome, has made arrangements for the sinking of a double-compartment working shaft to a depth of 500 feet, and will install a steam hoist.

The Bannie G. M. & M. Co. has been incorporated at Prescott. M. S. Taft is president, W. J. Wilsey secretary and J. J. Brooks Supt. The company will operate the Northern Belle, Jupiter, Bonnie, Georgia, Ethel and Fannie quartz claims, in Walker district, near Prescott, which will be started up at once. Machinery for deep sinking and a shaft to be sunk 500 feet will he started.

YUMA COUNTY.

M. L. Pool of the Desert Dwarf gold mine near Welton station, says the shaft is down 120 feet, and the ledge has widened to 36 inches, the value running from $15 to $30 per ton.

CALIFORNIA.

AMADOR COUNTY.

The first full monthly clean-up of the Keystone mine at Amador since the additional stamps were installed has been made. Five thousand tons were crushed during April. The yield averaged about $4 per ton. Under the improved conditions of mining the costs are now about $1.60 a ton. The air compressor to run the hoisting machinery has been started. Another economical move under contemplation is to have all drilling machines of the same make. Six machines will be installed. The ore is taken from the 900 level and levels above, and the ore bodies are so vast in the east vein, upon which the present prospects of the mine are based, that there is no likelihood of searching below the present works for a long time. About 100 men are on the pay roll, the use of machine drills having reduced the working force to some extent.

The water is all out of the Gover shaft, near Drytown, and the ledge has been exposed 84 feet wide of rock which assays about $4.30 to the ton. Grading for a new 80-stamp mill will be commenced this month and the mill will be put up during the summer. Rock from the Fremont shaft is still being crushed at the Pocahontas mill.

At the Sargent mine, at Middle Bar, a location for a shaft has been staked off and grading started. W. R. Thomas of the Central Eureka mine is Supt.——At the Farrell mine the tributers are sinking at the north end of the mine. About 1100 feet of tunnel has been run with a back of about 300 feet.——At the Del Ray the tunnel is in about 500 feet.

At the Lincoln mine at Sutter Creek the shaft is down nearly 2000 feet. It is believed that the rich shoot of rock recently struck in the Wildman, striking north towards the Lincoln, will be met with in the latter mine.

At the Central Eureka mine at Sutter Creek Supt. Thomas has changed his boiler plant from wood to crude oil for fuel.

The Edinburgh G. M. Co., recently incorporated in San Francisco to operate a mine near Wieland, has let a contract to drive the tunnel 500 feet along the vein. D. Fisher is Supt.

BUTTE COUNTY.

At the Golden Trout mine, near Lumpkin, a power plant is being put in to run the mill, pump works and all other machinery by electricity. The number of stamps will be increased to fifteen stamps.

CALAVERAS COUNTY.

The shaft in the Kiser-Maguire quartz mine on French hill, near Jesus Maria, operated under bond by F. O. Cortmarsh, is down 50 feet and crosscutting has been commenced.

The hoist at the Giuffra mine, near Jesus Maria, has been finished and the mill will now be started crushing.

C. H. Munroe, Supt. Oroville Gold Dredging & Ex. Co, working at Jenny Lind, says the dredger will be at work in about two months.

On the Cutler ranch, near Jenny Lind, prospecting to begin dredging is being done by Hammond & Carnduff.

The Sunrise mine at Railroad Flat has been temporarily closed down.

F. W. Allyn, manager of the Conrady gravel mine at Railroad, is preparing for a commencement of operations.

At the Vorlander mine, near Middle Bar, the shaft has been unwatered. It is the intention of the owners to begin active sinking operations at once.

On the Cassinelli, near Middle Bar, a well defined vein 3 feet wide, showing as high as $4 to the pan, has been struck.

DEL NORTE COUNTY.

M. T. Lawrence of Auburn and J. S. Goodwin of You Bet are opening hydraulic mines in the eastern part of the county.

EL DORADO COUNTY.

The Cosumnes copper mine, near Nashville, owned by J. Theisen of San Francisco, has been sold to the Rio Vista Copper & G. M. Co., and development work will commence on a large scale immediately.

The Omo mine, owned by the Omo M. Co., has been sold to J. H. Smith of Santa Rosa, and will be started up at once.

Work is being done prospecting the Little Joker mine, near Pilot Hill. Machinery has been installed.

Work on the tunnel of the River Hill mine at Placerville is to be resumed. The tunnel has been run about 700 feet and between 1000 and 1500 feet remains to be run to intersect the main shaft of the mine. Sinking is now in progress, 150 feet more depth taking it down to the level of the tunnel.

Some rich ore has been struck in the 700-foot level of the Mount Pleasant mine at Grizzly Flat. Supt. Jackson thinks it is as rich as any that ever came out of the mine.

INYO COUNTY.

Machinery for the Arondo M. Co. is being taken in from Johannesburg. The plant will include nine cyanide tanks, each 4x24 feet, a combination crusher and rolls weighing ten tons and a large gasoline engine for power. The company owns a group of thirteen claims, all showing large bodies of low-grade ore which is not free milling but yields to cyanide treatment. The plant will work 100 tons per day when operations begin. The main owners of the stock of the company are Dean & Jones of Johannesburg.

LOS ANGELES COUNTY.

M. Wiley of San Fernando has discovered placer ground about 7 miles north of San Fernando, adjoining his graphite claims in Pacoima canyon. He has been taking out gold from surface ground 12 feet above bedrock.

MONO COUNTY.

The 3-stamp mill of the Golden Gate mine in Antelope valley will be started about June 1st for the summer's run. Two new ledges have recently been opened up, making five in all of different grades and widths from which ore is being taken.

The upper cyanide plant of the Standard Con. M. Co., No. 2, at Bodie, which now treats tailings pumped directly from the mill, is to be torn down and moved to the No. 1 site. The capacity of the latter plant will thus be doubled, and all tailings to supply it will be hauled from the pond. The practice of treating the tailings direct from the batteries will be discontinued. The steam engine which was to be used in scraping the tailings pond being found unsatisfactory, an electric motor scraper is being put in, with which it is proposed to do the work of twelve horses under ordinary circumstances and to scrape out the slimes in places where horses cannot stand.

NEVADA COUNTY.

At the Gage & Hampton mine in Willow valley, near Nevada City, the double-compartment shaft is down 250 feet, and the rock shows free gold and an unusual amount of sulphurets. Grading is now being done for a mill.

The California G. & C. Co. of Spenceville have struck in their mine at Mineral Hill a ledge 8 feet wide, in which 4 feet is ore claimed to average over 10% copper, with some gold and silver.

C. O'Dell, Supt. Shady Creek mine, near Nevada City, which is being opened by a company headed by C. L. Canfield, says that work has been started up again. The dams have all been completed and a dredger will be built. The work was interrupted by the large flow of water in the creek.

The machinery at the Gold Tunnel mine, near Nevada City, is in place and the work of pumping out the old shaft commenced. The motive power is electric. J. Eddie is Supt.

Gale & DuBois, who recently bonded the Baldwin mine on Gold Flat, near Nevada City, have commenced work and are putting in 1500 feet of pipe.

PLACER COUNTY.

A rich vein of copper ore has been struck at Ophir by S. Bartlett, A. L. Smith and P. S. Lozano. The ore is in an iron belt and has a footwall of quartz. The ledge is 3½ feet wide at the foot of a 130-foot incline. The bulk of the ledge is meleconite or black oxide.

SAN BERNARDINO COUNTY.

A test run of 5000 pounds of ore from the mines of the Providence G. & C. Co., near Fenner, is being made to decide on a treatment process that will save the values. The mines have been worked at intervals during the past twenty years, and the new company is preparing to develop the property on a large scale. The ore is free milling and ledges are from 2 to 12 feet wide at the surface. Assays from croppings show average values ranging from $15 to $25 a ton. A 20-stamp mill is under consideration. J. H. Mathews of Los Angeles is president of the company.

SHASTA COUNTY.

C. C. Lawton has sold his one-half interest in the Independence mine at De Lamar to M. Lindley of the Shasta May Blossom M. Co. for $2000—$800 down. Prospecting has shown a good value in copper sulphides.

The Washington mine at French Gulch has been taken over by a new company, and the once rich mine will be reopened, after having lain idle for a number of years.

The Sybil mine, near French Gulch,

owned by G. A. Van Krusze, pays all expenses, including the installation of new machinery, from the prospecting work. Returns from the last shipment of twenty-five tons of the ore show an average of $202 a ton. Hoisting machinery is being installed.

A rich strike is reported to have been made on Salt creek, near Middle Creek, by S. Stewart, of a 2-foot vein of quartz.

SISKIYOU COUNTY.

The Portland company opening up a bar on the Tom Quigley ranch, above Walker, are completing a ditch from Beaver creek for supplying the elevator and giants.

J. M. Quigley of Oro Fino has fifteen men at work in his hydraulic claim. There is an abundance of water to keep the elevator and giants constantly in use until late in the summer.

Mr. Whitney of the Detroit Co., working the Buckeye Bar claim on Klamath river, is preparing to put in more machinery and apparatus for working the claim.

H. J. Barton of Oak Bar is preparing to work claims in the Oak Bar district.

The Phillips Brothers have discovered a promising quartz ledge near Salad creek and have bonded it to a Mr. Wilbur, who intends working it.

The Square Deal quartz mine, or Rusby mine, at Deadwood, has started up with a full crew. The company is about to enlarge the milling machinery by installing a larger boiler.

TUOLUMNE COUNTY.

T. R. Dunn of San Francisco has bonded from W. M. Phillipson of Confidence the Bowler, Minnie, Powell and Iron King quartz mines, near Confidence, a water right of 4000 miner's inches from the south fork of the Stanislaus river, and a ditch, until Jan. 1, 1903, at $12,500. A company is to be incorporated to develop the properties. The mines are operated by tunnels.

S. W. Van Syckel of San Francisco and F. J. Carman of Detroit have sold the Red Haugh, Lena Belle, Mayflower, Young American, Iron Cloud and Mayflower extension, also a mill site of five acres and improvements at Carters to the Red Haugh M. Co. of San Francisco. F. J. Carman, S. W. Van Syckel, S. C. Mason, J. B. Bradley and R. V. Ellis, all of San Francisco, are directors.

J. Kruger has bonded to W. R. P. Wirthle of San Francisco the Jupiter and Saturn quartz mines, near Jacksonville, together with the water rights connected with it, until March 18, 1903, at $6000.

C. G. Brush and H. T. Whitley of San Francisco have sold the Gladys mine at Big Oak Flat to the Gladys G. M. & M. Co., which is now engaged in developing the property.

Ballard & Martin of Jamestown have bonded the Lady Washington mine at Carters. The Lady Washington is on this side of North Fork from the New Albany, and the plan is to build tramways to the river and operate both properties with one mill.——W. H. Martin has bonded from Baker Bros. a piece of ground at Carters, believed to contain the extension of the Dead Horse vein. The bond is for two years at $12,000, work to be commenced in sixty days. Mr. Martin proposes to sink a shaft 600 feet and crosscut for the vein.

At the Long claim, 18 miles southeast of Carters, J. Long & Co., formerly of Jamestown, and his partner have sunk on their claim a shaft to a depth of 100 feet and struck ore that goes over $100 to the ton. The vein is 2 feet wide, the pay streak being about 14 inches.

In the New Era mine, near Stent, drifting is being done on the ore shoot on the 180 level which was recently struck. The ore body is 3 feet wide and of high grade.

The foundation is being laid for a 20-stamp quartz mill at the Lost Fox mine, 18 miles southeast of Carters, in the Buchanan section.

Operations have been resumed at the Clio mine at Jacksonville in a small way.

The App mine shaft at Quartz is 1200 feet deep and sinking is still continued.

The Mohican mine, near Sonora, is being steadily worked. The clean-ups give returns of over $20 to the ton.

H. J. Dykes of San Francisco is starting work on the Ajax mine, on the Berger ranch, near Sonora. The mine is being unwatered.

At the McAlpine mine, at Pinon Blanco, work has been commenced preparatory to a thorough prospecting of the property.

The Long claim, east of Summerville, is reported to be showing at a depth of 100 feet $100 a ton ore.

A shoot of rich ore has been struck in the Riverside mine, near Columbia, and the mill is working steadily. E. A. De Haven is the owner.

About seventy-five men are employed at the Harvard mine, near Jamestown, and thirty of the sixty stamps are being run. A connection is being made between the 550 and 800 levels. Three-ton skips are being used in the two shafts. As soon as development is forward, the force of men will be increased to about 125.

At the Horseshoe Bend mine, near Melones, work is being done in the tunnel from the river, following a large lead, and on the gallows-frame at the shaft. A hoist will be put in and sinking commenced. G. Morrice is manager.

YUBA COUNTY.

C. F. Adams has recently discovered a gold-bearing quartz lode between Woodville House and Clipper Mills. The ore taken out shows free gold.

COLORADO.

ARCHULETA COUNTY.

The Omaha M. Co. is working on a large vein of free milling gold ore near Pagosa Springs. W. R. Black is Supt. Machinery to put the mine on a paying basis is being installed.

BOULDER COUNTY.

The people working the Boulder County mine at Cardinal are about to add twenty additional stamps, which will be put in at once, to their 10-stamp rapid drop mill. A. Larson of Black Hawk is in charge of the mill.

At the Notro Dama mine at Sunset, owned by O. Landstrum, the shaft is 40 feet deep in ore which goes $16 per ton; 1000 feet of road will be built to connect the mine with the main road.

The Golden group at Magnolia, formerly owned by G. Fairhurst, has been sold for $40,000—$10,000 down—to Mr. Adams and others of Cripple Creek, who will put on a hoisting plant and sink the shaft 500 feet deeper at once.

The Cripple Creek people who recently bought the Cash mine, at Magnolia, are replacing the old machinery by new and heavier machinery and are putting in a 160 H. P. boiler and a five-drill compressor. The company has opened up a 3-foot vein in the 140-foot level, which is reported to run $70 per ton.

CHAFFEE COUNTY.

J. D. Whitehurst and G. Sullivan of Salida have bonded the Grand View mine at Turret to E. D. Lowe of Victor at $10,000. A hoisting plant is to be installed at once.

CLEAR CREEK COUNTY.

Nelson Bros. have taken a five years' lease on the McKinney and Key West lodes at Georgetown and propose extensive development. Mill runs from the Key West have returned as high as 750 ounces in silver, 10½ ounces in gold and 28% in lead. A drift is to be run on the McKinney and a crosscut made to the bottom of the shaft on the Key West.

A twenty-year lease has been granted the Georgetown G. M. Co. on the minerals under the streets of Georgetown at a royalty of 10%. Work will be commenced in the near future at a point where it is believed the vein found in the Garharino well will be disclosed at slight depth.

The Allan mill, near Idaho Springs, has been bought by the Gold Cord M. & S. Co. for about $10,000, and its reconstruction will be made at once.

CUSTER COUNTY.

No. 1 shaft on the Valley mine at Silver Cliff is down 200 feet, all in low-grade ore, but reducing readily and at small cost. The pyritic ores encountered are believed to be a strong indication that the formation and the minerals are going to be identical with Leadville.

DELTA COUNTY.

C. L. Pike, of Hotchkiss, says assay returns on ore found, it is said, on Crystal creek, in the Black Mesa country, showed 22.5 ounces gold to the ton. The Black Mesa, where this sample was found, is about 30 miles south of Hotchkiss, and is a high and wide strip of mountain country lying between the North Fork valley and the Black canyon, below Gunnison. It has been known that placer gold has been found paying wages by panning at points along the Gunnison river in the Black canyon, and prospectors believe that they have struck one of the lodes from which it comes. The formation is a brownish quartz, interspersed with yellow talc, which seems to carry the real value.

GILPIN COUNTY.

The Four Mile Gulch M. Co. has commenced work enlarging the Klondike tunnel, near Central City. The same company is preparing to run the Wheeler tunnel in to connect with the Klondike tunnel. The underground work is under J. Brohl, foreman.

Denver people have bonded the Lone Star mine, near Enterprise. A plant of hoisting machinery is to be installed. The property is owned by J. R. Miller and others.

The Morning Star mine in Pleasant Valley is being operated by the Ahhandwal M. Co., in which Boston people are interested, with C. Morgan of Idaho Springs as manager. A small shaft building and plant of machinery have been installed on the property. Drifting and stoping are being carried on in the 250-foot level. Concentrating ore is being shipped to the Wilkie mill at Idaho Springs and smelting ore is being sacked for the sampling works. The underground workings are in charge of J. Stasney. The company is figuring on buying the Arizona claim, adjoining, on which they may install a large hoisting plant.

The Klondike group, near Russell, is being operated by the Keystone G. & C. Co., with J. L. Mitchell as Supt. The shaft is down 230 feet on a ledge showing between 8 and 9 inches of ore carrying values in iron and lead sulphides. It is believed that the company will install a hoisting plant in the near future.

The Town Topics G. M. Co., M. D. Draper manager, operating the East Notaway mine, near Lake, has been opening up new ground and is installing a new and larger hoisting plant at the working shaft.

JEFFERSON COUNTY.

The success of the new hot air furnace at the Carpenter smelting works at Golden is reported. The saving in consumption of coke and other fuel is stated to be fully one-half, and there is also a very large saving in the consumption of lime rock. Three hundred tons of ore is treated every twenty-four hours, a considerable increase since the hot air furnace was started up.

LAKE COUNTY.

A proposition to construct an electric line in Leadville, an electric railroad to connect with the mines of the district, and an electric plant sufficiently large to furnish power to the mines and smelters of the district is under consideration. It is understood that water and reservoir rights have been secured and it is the intention to furnish electricity from a water power plant. To prevent failure in the power through a severe winter a subsidiary steam plant will be erected at Malta. It is stated that something like a million dollars will have to be expended in the enterprise. Electric power, it is estimated, can be furnished to the mines much cheaper than they can generate their own steam.

The output of Leadville mines for April was 2150 tons daily, or a total of 64,500 tons. The daily production from the different sections are as follows: Leadville basin, 650 tons; Carbonate hill, 250; Breece hill, 500; California gulch and Iron hill, 475; Fryer hill, 75; zinc ores, 125; outlying districts, 75. The tonnage of April exceeded that of March by 5000.

OURAY COUNTY.

The Camp Bird M. Co. has been incorporated, capital $50,000 with 500 shares, $100 per share. Incorporation, it is stated, was placed at a low figure in order to save fees. The principal officers of the company will be in London, England, and the officers are: S. W. Baker of London, president; H. Richards of London, secretary, and J. W. Benson, former manager of the property for T. Walsh, resident manager. The company will operate both in San Miguel and Ouray counties, and it is reported is organized to take over the Camp Bird mine at Ouray.

SAN JUAN COUNTY.

Manager J. McCoy says a 3-foot vein has been cut in the Index tunnel, near Silverton, which is a cream-looking quartz, exceedingly rich in gold. He states that the Index M. Co. will build a 2-mile tramway line and concentrating mill.

The Trans-Atlantic group at Silverton will be developed this season by a Chicago company represented by W. C. Munsell of Denver, who has the property bonded from J. Reynolds of Silverton. Work has been started cleaning up the main tunnel.

At the North Star mine at Silverton H. Starkweather, Supt. for a Chicago, Ill., company, the old original North Star vein has been struck and found to be 4 feet in width, the entire vein carrying a high grade of copper and gold ore.

SAN MIGUEL COUNTY.

J. H. Shockley, manager at Telluride of the Four Metals M. Co., says that in two months his people will start the erection of a 100-ton reduction plant with forty stamps. The mine is located in Turkey Creek basin.

The annual report of the president, treasurer and Supt. of the Butterfly-Terrible G. M. Co. of Telluride shows operating expenses of the mill were 56 cents per ton of ore and the total cost of mining, including supplies, as well as tramming, crushing, blacksmithing supplies, was $3.92 per ton. The balance sheet shows receipts from bullion, $63,454.29; from concentrates, $10,113.57. C. Bullock is president, F. J. Hobbs treasurer, and D. J. Sayer Supt.

The Cashin mine at Paradox is idle, the reason given being that a method has not been found by which half the values can be prevented from going away with the tailings. The principal value is copper, and it appears that most of it gets away from the plant now in operation. The ore taken from the mine carries high values.

SUMMIT COUNTY.

The Bucyrus dredger on the Swan mine at Breckenridge has been started up for a season's run. Manager Dyar of the American Co. will, besides the dredger, operate the placer at the mouth of Galena gulch, and the Peabody and Gold Run placers.

TELLER COUNTY.

A cyanide reduction works is to be constructed on Ironclad hill, at Cripple Creek, to treat the low-grade ore in the Ironclad mine, which will not pay any hauling charges. The ore shoots vary from 10 to 20 feet in width and the ore runs from $4 to $7 per ton, and is so thoroughly oxidized that it is adapted to direct cyaniding and can be handled cheaply. It is the intention to build the mill at the present dump. The ore will be hoisted and dumped into a hopper, from which it will go through rollers and then into tanks where the cyanide solution will be started.

Mr. Lewis and associates, leasing on the Colorado King claim, at Cripple Creek, have made a strike, practically at the surface, in a shaft down 8 feet, opening up a vein 4 feet wide. At 15 feet, three tons, made as a trial shipment, gave returns of $70.40 a ton. It is the belief of Mr. Lewis and associates that they have opened up the vein of the Temonj mine adjoining.

At a depth of 1000 feet in the Golden Cycle mine a vein has been struck in cutting the station which yields assays from screenings of between $40 and $60 gold to the ton.

The Bedford G. M. Co., by its Cripple Creek agent, E. J. Moxley, has undertaken to solve a low-grade ore problem of the Cripple Creek district. The company will install a 100-ton concentration plant, work of construction to commence immediately, with the expectation of being able to start the mill by the first of August. The ores will be trammed from a tunnel and dumped into the crushing department, going thence to the concentrating room, where eight tons will be reduced to one. In addition, the company has decided to build a small cyanide plant to handle the tailings from the concentrating mill. Tests made with cyanide treatment show from 93% to 94% of values saved. The company is working a vein 90 feet wide which yields an average value of between $6 and $8 per ton.

The Lexington Co. reports that the lessees operating its Gold hill property at Cripple Creek shipped 450 tons during April, average grade $30 in gold to the ton, producing $13,500. The lessees are now stoping above the 135-foot level in a vein which, in many places, measures 12 feet between walls. About 4 feet of the vein runs good pay, and the balance is all mineralized, but of a very low grade.

IDAHO.

BLAINE COUNTY.

O. Rorem has bonded the Fisher mine and mill, about 40 miles beyond Galena, at $120,000. He is privileged to operate the mine, the royalty to apply upon the purchase price. He expects to begin milling by June 1. Last summer the mill crushed an average of thirty-two tons a day of ore that yielded over $7 a ton. The ore is free milling.

CUSTER COUNTY.

R. Bell has sold the old Montana mine of Yankee Fork district, near Challis, to Eastern people. The new owners, it is stated, will start development at once. It is stated that J. Hutchinson, late manager of the Trade Dollar mine at Silver City, will superintend the development.

IDAHO COUNTY.

A strike is reported on the west fork of Monumental creek, in Thunder Mountain district. The formation is blue porphyry and is 1½ mile wide. C. Brewer and Behendorf Bros. are the discoverers. The porphyry is crystalline and has, it is said, the appearance of onyx. The pan tests of the porphyry are said to show good values in free gold.

C. I. Flock, an owner in the San Francisco group of claims at Hump, is preparing to do considerable work upon the mine this season.

The Hydraulic M. Co. at Lucile and Slate creek, on the Salmon river, is bridging the river at Slate creek to carry 5000 inches of water across the river to work the high placer bar on the west side. The bridge will be 225 feet above high water. It is expected that the work will be completed this season.

SHOSHONE COUNTY.

The St. Joe Basin Placer M. Co. of Colorado Springs, Colo., has been incorporated, capital $2,000,000, to operate near Wallace. The directors are E. Edmundson, Jr., G. B. Leonard, L. H. Crick, J. T. Golden, J. Robinsteen and C. Ehnl of

Pittsburg, Pa., and W. T. Hales of Wallace.

WASHINGTON COUNTY.

R. E. Johnson and G. Wells are reported to have made gold discoveries on Clear creek, near Payette, while prospecting for Boise people. A tunnel and cut have been started on ledges which give good prospects. Five or six parallel ledges 2 to 3 feet wide run through the claims from 50 to 100 feet apart.

KANSAS.

Prof. E. Fahrig of Philadelphia, Pa., says he has discovered a method by which commercial values can be obtained from the gold-bearing shale in western Kansas. He has given results in twelve tests from four species of shale, claiming them to show that there is an average value of $2.80 gold per ton of shale. The minimum amount of gold found in any one ton was 60 cents, and the maximum was $6.75. It is stated that it has been decided to erect a plant of 100 tons daily capacity after plans prepared by the professor.

MICHIGAN.

HOUGHTON COUNTY.

At the Calumet & Hecla mine at Calumet a new timber car has been tested in No. 2 shaft. By the use of two cars twenty-four skiploads of lumber can be sent underground in two and one-half hours. This will result in a gain of six to eight hours daily available for hoisting rock. These cars will probably be introduced in the other shafts of the mine.

MONTANA.

The deposits of gold and silver at the assay office at Helena during April amounted to $103,312.49 for Montana and $34,490.87 from other States and Territories. The deposits in April, 1901, were $97,654.96 from Montana and $57,297.79 from other States and Territories.

DEER LODGE COUNTY.

A rich strike of free milling gold ore is reported made in the Metz mine at Anaconda, in the incline shaft, at a depth of 120 feet from the surface, some of the ore taken out running as high as $500 to the ton. The ore body is said to be 2 feet wide.

FERGUS COUNTY.

The Kendall King Cyanide G. M. & M. Co. has been incorporated at Kendall by M. Solomon, F. Elliott, W. C. Archer, G. A. Taylor and A. Wilson, capital $300,000, to operate the Minnie Healy and Baby Boy gold mines near Kendall.

JEFFERSON COUNTY.

Only the pumps are now in operation at the Elkhorn mine at Elkhorn, the mining of ore waiting on a cheap railroad rate to market.

MADISON COUNTY.

R. F. Krause and J. Smith, of Butte, have taken an eighteen months' lease on the Silver Bell mine, near Virginia City, from the Elling estate. The mine has been worked to water level. The lessees will erect a steam hoist of 25 or 30 H. P. and unwater the mine.

SILVER BOW COUNTY.

P. Mullins and associates have bonded several pieces of ground at Butte and have started the work of exploration on a shaft which they are now sinking on the Yankee Boy placer claim. The shaft is to be sunk 150 feet; and if the showing is good, another 100 will be added at once.

NEVADA.

ESMERALDA COUNTY.

The Lone Mountain strike, 60 miles west of Tonopah, is holding up with the first reports. Free gold can be seen in much of the ore now. Plenty of wood is close to the camp, and water, it is believed, can be developed. C. D. Van Duzer of Tonopah has an option on the main group of claims. The camp has been named Weepah.

HUMBOLDT COUNTY.

The Sheha G. & S. M. Co., in its No. 2 tunnel at Mill City, is reported to have struck ore going $6 a pound. C. W. Greene is Supt. Manager W. H. Child, at Salt Lake City, Utah, says ore of fine shipping quality is developed in three places.

LINCOLN COUNTY.

The New Era M. Co. at Searchlight is installing a new hoist and will erect a roller mill. H. A. Perkins is manager.

The Quartette mill at the river has been started up and is working on ores from the Dunn group at Searchlight. The Quartette expects to average about $40,000 a month output in gold bullion.

The Searchlight M. Co. of Searchlight, F. P. Swindler manager, is putting in a 10-stamp quartz mill.

LYON COUNTY.

On the Nevada Chief mine, near Rockland, Vaillencour & Collier have finished a contract on running a 50-foot drift. The last 20 feet passed through a ledge of high-grade ore averaging 2 feet in width, which is claimed to go about $200 per ton.

The Nevada Reduction Works, near Dayton, is to put in a water wheel below the Rock Point dam to provide power for pumping, etc., at the cyanide plant, in order to do away with the more expensive steam power.

NYE COUNTY.

A new discovery has been made by W. McWilson, 10 miles east of Tonopah, that shows a well-defined ledge of quartz that runs well in both gold and silver.

The Tonopah Co. at Philadelphia, Pa., has elected A. Brock president, C. R. Miller vice-president, C. Highee secretary and treasurer, and C. A. Daniel, W. J. Mendenhall, R. H. Rushton, J. F. Anderson directors.

WASHOE COUNTY.

J. Sheehan, it is reported, has made a rich strike on the Crown Point mine at Olinghouse. The ledge, broken into at three points, assays from $300 to $500 per ton.

NEW MEXICO.

GRANT COUNTY.

It is announced that operations will be resumed on the Wild Cat group of the Clifton Copper Co., near Santa Rita, in the near future.

L. Deming, manager of the Allesandro M. Co., operating on the Gettyshurg group at Burros, has the main shaft down 110 feet and a good body of sulphide ore exposed. The sinking of a well will be made to get a supply of water for a 50-ton leaching plant, which it is the intention of the company to erect. A contract has also been let to G. D. Reid to run a 1000-foot tunnel.

The new concentrator owned by the Lena M. Co., at Lordsburg, has shipped three carloads of concentrates which netted $500.

A new vein of ore has been discovered in the Carbonate mine, near Lordshurg, 10 feet in width and assaying $20 per ton.

The Last Chance M. Co. has bought ground in Lordshurg for the erection of a 50-ton concentrator.

SIERRA COUNTY.

The New Era group, near Chloride, has been sold to a Boston company by C. T. Brown of Socorro. Development and prospect work has produced two cars of high-grade ore and several hundred tons of good milling ore that will he worked on the ground. A douhle-compartment shaft has been started and a pumping and hoisting plant is now being put in place. A 10-stamp mill is under consideration to he put in. J. L. Terry is Supt.

OREGON.

BAKER COUNTY.

The shoot of ore recently encountered in the North Pole mine, near Sumpter, is 65 feet long and from 3 to 7 inches in width. The ore, it is stated, runs from $2 to $10 per pound. The ore was a black sulphide similar in character to the rich ore found in the Columhia and Golconda mines, which are located on the same vein, known as the mother lode of the slate helt.

At the Black Hawk mine, owned hy F. W. Wheeler and others of Detroit, Mich., at Robinsonville, an average output of $100 a day is being made with a small mill.

A strike is reported of rich ore hy M. Dourty in the Yellow Daisy group. An arrastra to be run hy water power is heing erected.

A strike has heen made of 7 inches of what appears to he almost pure cohalt in the Standard mine, owned hy Z Houser & Co. of Portland, near Quartzhurg. It is reported that the ore in the streak assays $243 gold. Cohalt values are reported to have steadily increased with depth, together with gold. The ledge has a surface width of 30 to 50 feet.

JACKSON COUNTY.

The mill on the Lucky Bart group at Gold Hill is running on ore from the Doubtful claim, on which a 30-inch vein of high-grade free milling ore assaying $45 per ton was recently struck.——The Gold Hill M., Power & Dev. Co., in their Bowden mine, in Blackwell district, is down 135 feet in 3 feet of free milling ore carrying an ounce of gold per ton. It is the intention to sink to 750 feet.

The Gold Hill Quartz M. Co., C. R. Ray, Supt., operating the Braden mine near Gold Hill, will install a new mill for the present ten stamps.

JOSEPHINE COUNTY.

The old Channel mines of Galice operate two giants and a ground flow that is used in washing out Rich Gulch canyon just helow the diggings where operations are being carried on. In this canyon there was an accumulation of wash gravel and tailings to a depth of 35 feet or more which had been dammed up. Manager Harvey put in sluices below the gravel and has washed the whole canyon down to the hedrock, making a rich cleanup from this gravel. The two giants are working upon a hank over 200 feet in height, which pays evenly and well from the grass roots to the hedrock. The red clay capping on top contains flour gold and this is saved by a system of undercurrents.

W. Bohle has sold his placer mine, situated in Grave Creek district, near Grants Pass, to Mr. Wilson of The Dalles for $2000. —— A tunnel is being run on the Orme quartz mine in Foots Creek district. —— A half interest in the Yokum & Madden quartz mine in Grave Creek district has been bought hy J. E. Auten, and considerable work is heing done on it. —— W. E. Finney has honded his quartz mine in Steamboat district to H. Kling for the Seattle Co-operative M. Co., who will run a tunnel. ——Work has been hegun on the dam of the Golden Drift M. Co. in Rogue river to furnish water and power for operating the company's placer mines. —— The company which has bonded the Eureka mine in Soldier Creek district is putting in two carloads of machinery. G. J. Coles is president of the company. —— In the Gopher mine in Jump Off Joe district, under T. Lacy, Supt., considerable development work has been done and a hody of fine ore exposed. There is a small mill at the mine.——Capt. Leavenworth and associates of Olympia, Wash., are erecting a 30-ton mill and concentrator on their Mayhelle group, a low-grade base ore property.

A smelter and complete plant for treating copper ore is heing installed on the Sewell copper mines at Waldo, owned hy the Mountain Copper Co. They have heen opened up to a good depth, exposing a body of high-grade copper ore.

Preparations for building the Oregon & Pacific Railroad out of Waldo are resulting in all availahle copper claims being taken up and old ones more thoroughly worked.

The holler and other machinery for the Eureka mine on Soldier creek, near Grants Pass, has been taken into the mine.

In the Ajax mine at Leland the company has struck rich rock in its new tunnel.

LANE COUNTY.

A snowslide in the Blue River mining district struck over the mouth of the longest tunnel of the Treasure mine, and the blacksmith shop, engine house, machine shops and hunk houses were carried to the bottom of the canyon. The mouth of the tunnel is filled with 60 feet of dirt and debris. The snowslide occurred when the twenty or thirty men employed were away from work.

UNION COUNTY.

The Fargo M. Co. is reported to have made a rich strike on the Last Chance claim, near Imnaha, of a ledge of copper sulphites and bornite, which has heen exposed 100 feet in the tunnel. Crosscuts show from 12 to 14 feet of ore, assaying an average of 35% copper.

SOUTH DAKOTA.

LAWRENCE COUNTY.

On the 350-foot level of the Glover G. M. Co.'s property at Lead a hody of free milling gold ore in a large vertical quartz vein has been struck. G. W. Glover is president and manager. The shaft is equipped with a whim hoisting plant, hut it is the intention of the company to install a steam hoist without delay.

The Horseshoe M. Co. has decided on plans for the cyanide mill it is projecting at Pluma. The mill will he wet crushing, with stamps, constructed on the terrace or gravity plan. The hattery will be 300 1100-pound stamps, arranged in two rows of thirty double-discharge mortars in each row. Two No. 7½ Gates rock crushers will he located on a hedrock floor above the stamp hatteries. The hatteries will occupy a frontage space on the hill of 216 feet. The iron structure that will enclose them will he somewhat longer. The boilers and engines of 800 H. P. will he located in a separate huilding, adjoining. The tank room will he situated on a level plat at the hase of the hill, below the crushing machinery. This building will he 525x125 feet and will contain six leaching tanks, 6 feet deep hy 50 feet diameter, having a capacity of 500 tons each, and six slime tanks, 20 feet deep by 50 feet diameter, with a capacity of 1833 tons each; also three solution tanks, 8x50 feet. The whole works, from base to apex, will have an elevation of over 200 feet. The Horseshoe ore will requlre pulverization through 10 to 16-mesh screens. The plant will have a crushing capacity of 1200 tons per day, and a leaching tank capacity of 1700 tons.

UTAH.

BEAVER COUNTY.

A. B. Lewis is completing the buying of the Comet mine at Millford and is organizing the Columbia Company to develop it.

IRON COUNTY.

The Johnny mine at Stateline, W. J. Dooley, manager, is to have a mill, the construction to cost approximately $30,000.

JUAB COUNTY.

Capt. Bridges, manager of the St. Louis-Eureka property at Tintic, states that the directors have authorized the installation of hand-power drills in the mine.

KANE COUNTY.

The Copper Cliff M. & M. Co., of Springville, has heen incorporated, capital $20,000, with W. A. Warthen, president, and H. L. Cummings, secretary and treasurer. The company owns the Copper Cliff, Kruger, Iron Duke and Jim Lew claims in the Pahroah district.

SALT LAKE COUNTY.

The Utah Consolidated Gold Mines Co., Ltd., annual report for 1901 shows a balance to profit and loss after payment of $800,000 dividends, of $649,468, against $882,779 on the same date in 1900. Sales were: Gold, 14,782 ounces, $295,645; silver, 240,880 ounces, $137,157; copper, 7,123,197 pounds, $1,163,900; total, $1,596,703. During the twelve months ending Dec. 31, 1901, the smelter treated 167,823 tons of sulphide ore, an average of 460 tons per day. When copper prices dropped approximately 1,500,000 pounds of refined copper were on hand and 2,500 000 pounds in transit and process of refining. The average price realized on sales since May, 1899, to the end of 1901, was 15 31 cents per pound. Manager Channing estimates that 95,000 tons of sulphide ore are in sight.

SUMMIT COUNTY.

The territory consisting of the properties of the old Crescent, Apex and Boss companies, at Park City, together with other locations, ahout sixty claims in all, have heen consolidated hy Thos. Kearns and D. Keith, who have organized the Kearns & Keith Co. to operate it. T. Kearns is president; D. Keith, vice-president, and J. F. Westcott, secretary and treasurer. The new company will operate its territory in part through the old Hanauer tunnel. In the near future a big electric plant is projected to operate drills, cars through the tunnels, machine shops, etc., as well as to light the works and mines.

Mrs. Pbœbe A. Hearst and J. B. Haggin have hegun suit to annul the conveyance of its property made by the Putnam M. Co. to the Quincy M Co. and the suhsequent conveyance of the Quincy M. Co. to the Daly West M. Co., and ask that they he awarded about 7% of all the moneys earned by the Quincy M. Co., including $1,200,000 which, it is recited, has been paid in dividends, and of $200,000 that remained in the treasury when the transfer to the Daly West was made; and that a decree be entered in their favor for $\frac{6586}{100000}$ part of the stock received or to he received hy the Quincy M. Co., together with interest, less $3194.22 that has heen received.

WASHINGTON.

SNOHOMISH COUNTY.

The 100-ton concentrator at the Ethel mine, near Index, has heen started up. The concentrates resulting from the operation of the plant thus far are said to be very high grade. The first check assay off the sliming tahles went $211; while from the finer jigs the results were $162. The ore concentrates ahout 10 to 1, giving a product of some 60% copper, 200 ounces in silver and from $12 to $15 in gold. At the mine stoping ground is hlocked out to keep the mill running for some time, while several thousand tons of ore are already mined. The mine is equipped with air compressor, power drilis, electric lights, tracks, ore cars. There are upwards of 3000 feet of levels and upraises, a large part in ore. G. A. Pounder of Seattle is manager.

FOREIGN.

BRITISH COLUMBIA.

The Mining Exchange, Ltd., of Nelson, says: The installation of the 297 H. P. electrical plant at the Hall mines smelter at Nelson has been completed and it is now in operation. Besides the installation of this plant many improvements have been made in the building and machinery. The installing a power plant at the Camborne group on Fish river, Lardeau, owned by the Northwestern Dev. Syn. of Nelson, is nearly completed and the plant will he in operation by June. It will operate electric drills. The Slate Creek Hydraulic Co. of Seattle, Wash., has bought 320 acres of placer ground on Slate creek, in Similkameen, which they will work for platinum and gold. Operations will hegin at once. Three veins of bituminous coal, aggregating 29½ feet in thickness, have heen cut by the diamond drill on the Vermillion Forks M. and Dev. Co. mine at Princeton. The first at a depth of 35 feet is 4½ feet thick; the second 6½ feet in

thickness at 40 feet, and the third 18½ feet thick at 27½ feet. A group of claims on Crawford bay, near Ainsworth, the ore of which is said to carry gold, silver, nickel and copper values, has been bonded to an English company represented by A. W. Heyland, at $25,000 for two years. A 60-drill compressor will be installed by the Granby Con. M., S. & P. Co.. to be operated by electricity. The ore shoot on the Fisher Maiden group, near Slocan, has been drifted on for 40 feet. The pay streak is 27 inches wide and averages 150 ounces silver to the ton. Four carloads of ore have been taken out in development. McCuaig, Rykert & Co. of Montreal, Canada, have bought the Noonday mine, near Slocan, which, it is said, will be operated in connection with their Galena Farm property. A concentrator is to be erected.

S. Norman, ropresenting the Ohio & Northwest Dev. Co., has bonded the Black Prince group of five claims on Lemon creek at $85,000 for two years.

Nelson, May 5.

The Vancouver, Pearl and Pothole claims near Similkameen have been bought by W. T. Shatford of Slocan City for $15,000 from Murphy, Angsteadt & Allen. The Pothole, located on a strong, iron-capped dike, carries values in gold and silver, the copper values increasing as depth is attained. On the Pearl a tunnel has been driven 60 feet.

The North Star M. Co. at Kimberly has resumed operations, putting on forty men. A 4-foot ledge of solid galena has been struck just below the 60-foot level, and a very rich lead with the diamond drill. A contract has been let for a 600-foot tunnel into this last strike.

E. G. Boynton and A. S. Trow of Merrillan, Wis., for the Perry Creek M. Co., have bought creek and bench diggings on Perry creek, near Fort Steele, about 2 miles long by half a mile wide. The ground was worked over in the early days and a large amount of gold reported taken out by panning and rocking surface ground. The company is proceeding at once to install a large plant. The intention is to sink to bedrock and drift, using hydraulic elevators to hoist the pay dirt to the surface.

At the Mother Lode mine at Greenwood the company has installed a large crusher plant, making possible the increasing of output of ore and at the same time lessening the number of men required to get it out. The working force has been reduced by about fifty men.

YUKON TERRITORY.

The accounts of the Klondike Consuls Co, operating in the Klondike, as reported at the 1902 meeting of the company in London, show that the total output of gold amounted to £88,197, while the Klondike expenses, including government royalty of £4289, were £49,915. London and other expenses amounted to £3842, thus making the net profit £34,440, which, with the balance brought forward, was increased to £48,207. The dividend of 15% absorbed £37,500, leaving £10,707 to be carried forward.

Personal.

S. O. TRESCOTT of Denver, Colo., is in Prescott, Ariz.

W. W. WISHON has returned from Pony to Butte, Mont.

C. E. FORCE, manager Bobtail M. Co., Ray, Ariz, is in New York.

C. L. MAGNUM is Supt. Granite Hill mines, near Grants Pass, Or.

C. C. BITNER is Supt. Cal. G. & C. Co.'s copper mine, Spenceville, Cal.

F. P. SWINDLER is manager Searchlight M. Co., Searchlight, Nev.

F. H. PROBERT of Los Angeles, Cal., was in Clifton, Ariz., last week.

W. A. DOBLE has returned from Denver, Colo., to San Francisco, Cal.

W. G. MOTLEY is now operating the Buckeye mine, Nevada City, Cal.

J. B. BALCOMB, Supt. Heald's School of Mines, is in Shasta county, Cal.

C. R. RAY, manager Gold Hill Q. M. Co., Gold Hill, Or., is in San Francisco.

R. TEWKESBURY has been appointed foreman Transatlantic mine, Silverton, Colo.

J. W. BENSON, manager Camp Bird mine, at Ouray, Colo., is in Washington, D. C.

J. H. STRITE is Supt. construction for the Tomboy Mines Co., Ltd., Smuggler, Colo.

B. B. THAYER, Supt. of the Santa Rita M. Co., at Santa Rita, N. M., is in New York.

A. E. RITER has been appointed Supt. Little Joe mine, at Hope, Kootenai county, Idaho.

H. LEE HUSTON is now Supt. Emma G. M. Co. of Boston, Mass, at Mokelumne Hill, Cal.

FRANK LLOYD has been appointed assistant manager Arizona G. & C. Co, Patagonia, Ariz.

J. A. HALL, manager Caldwell mine, at Granite Basin, Plumas county, Cal., is in San Francisco.

ALEX. VEITCH succeeds James Colquhoun as general manager Arizona Copper Co., Clifton, Ariz.

RICHARD A. PARKER of Boston, Mass., consulting engineer U. S. M. Co., is sojourning at Las Vegas, N. M.

H. BLACKWELL, formerly of Marquette, Mich., has been appointed manager Anderson Lake, B. C., gold mine.

W. WESTERVELT, of New York, consulting engineer for the Ray Copper Co., at Ray, Ariz., is at that place.

S. W. MUDD, of Leadville, Colo, is engaged in an examination of some of the large Cripple Creek, Colo., mines.

O. TOWNSEND has been appointed general manager Baby McKee and Last Chance Mining Companies, Sumpter, Or.

J. A. FLEMING, manager of the Black Warrior Copper Co., Amal., has returned to Black Warrior, Ariz., from San Francisco.

T. W. FORRESTER of Cedar, Utah, has gone to Cerro del Pasco, Peru, as one of the staff of the Cerro del Pasco copper mines.

H. W. FAIRBANKS, geologist, of Berkeley, Cal., is at Las Cruces, N. M., where he will study the geology of the Rio Grande valley.

C. A. SANDIFORD, E. M., has been appointed Supt. of the Anglo-Slocan Syndicate, Ltd., for the Wakefield mine near Silverton, B. C.

JAMES COLQUOHOUN, manager Arizona Copper Co. for eighteen years at Clifton, Ariz., has resigned and gone to Edinburgh, Scotland, to reside.

AT Santa Fe, N. M., the New Mexico School of Mines has selected Charles R. Keyes of Des Moines, Iowa, as president of the institution, to succeed F. A. Jones.

JOHN PLAYER, Supt. of machinery and motive power of the Atchison, Topeka & Santa Fe since June, 1890, will resign June 1. The office will be discontinued.

H. W. TURNER, late of the U. S. Geological Survey, has returned to San Francisco, Cal., from an absence of six months in Oregon examining quicksilver deposits.

W. P. HEADDEN of Cripple Creek, Colo., has been appointed manager for the Gowers Mines Syndicate, operating the Running Lode mine, near Black Hawk, Colo.

FREDERIC IRWIN has resigned as Supt. of the War Eagle Tunnel, at Silver City, Idaho, to accept the position of manager of the Dewey mine, at Thunder Mountain, Idaho.

R. HARROP of England, formerly of the Esperanza mine, near Placerville, Cal., is now at that place engaged in a mine examination in the interest of British investors.

P. NICHOLAS has resigned as manager Longfellow mines of the Arizona Copper Co., Clifton, Ariz., but continues his connection with the company as consulting engineer.

Catalogues Received.

The Brunton patent pocket transit is the subject of the latest catalogue issued by Wm. Ainsworth & Sons, 2151 Lawrence St., Denver Colo., illustrating and describing the uses of that valuable instrument, of which the manufacturers say there are now over 1000 in use. The catalogue contains thirteen fine engravings and gives detailed description of the instrument. A copy will be sent anywhere on request.

The California Electrical Works of 547 Mission street, San Francisco, Cal., has issued a folder descriptive of the several types of Emerson fans operated by alternating current electric motors. These fans are designed to ventilate and cool heated apartments, and operate with an exceedingly small consumption of power. At the beginning of the hot season the catalogue offers timely and interesting information.

A. Leschen & Sons Rope Co., 920-922 N. First St., St. Louis, Mo., send their catalogue, No. 23, which, in its eighty pages, beside detailing the merits of their manufacture, gives a great deal of valuable technical information regarding transmission, hoisting and hauling ropes, steel cables and appliances, including packing, oakum, snatch and tackle blocks, sheaves, chains, clips, turnbuckles, wire rope preservers, etc. An illustrated chapter on wire rope splicing and a description of the Leschen Co.'s patent automatic wire rope tramway is of noticeable value. Percy R. Stuart, 85 Fremont St., is the San Francisco agent. A request addressed thereto, or to 92 Center St, New York, 137 East Lake St., Chicago, or 920 N. First St., St. Louis, Mo., will bring a copy of the treatise to any one.

Commercial Paragraphs.

E. J. KENDALL, manager Three Stars mine, Placer county, Cal, has a pneumatic hammer, from Eccles & Smith, 91 Fremont street, San Francisco, which is a money saver.

THE statement in the issue of the 3rd inst., that the Standard Diamond Drill Co. of Chicago "continues the manufacture of the Bullock diamond drills," was a little misleading. It is not the intention of the company to continue to manufacture the "Bullock" drills, but they manufacture a distinct type of drills which they say "contain all the excellencies of the old Bullock drills."

THE W. J. CLARK CO. of Salem, Ohio, who make the "Lane patent" joist and timber hangers, are issuing a new illustrated price list of hangers, in which is given not only the width and thickness of steel plate of which each of the many sizes of hangers are made, but also a table showing the load which each respective size of hanger sustains without showing any sign of bending or yielding in any way. Norway pine timber was used in the tests, and it was found that the timber would mash before the hangers would bend or move. No hanger showed any sign of breaking in any of the tests, though they wore loaded to all that the timber would bear. For example, a hanger for a 10x14 timber was loaded to fifty tons when the timber began to crush and the banger to straighten. Anyone contemplating the use of hangers should send for the new hanger list which has the table of strength of each size of hangers.

Recently Declared Mining Dividends.

	Payable.
Bunker Hill & Sullivan M. & C. Co., monthly, $29,000	May 5
Town Topics G. M. Co., Colorado, No 5, $5000	May 10

Books Received.

"The Quaternary of Southern California," bulletin of the Department of Geology, by Oscar H. Hershey, is an addition to the records of teohnical study of the areal geology of California. Published by the University Press, Berkeley, Cal.; price, 20 cents.

Latest Market Reports.

SAN FRANCISCO, May 16, 1902.

METALS.

SILVER.—Per oz., Troy: London, 23⅝d (standard ounce, 925 fine); New York, bar silver. 51½c, refined (1000 fine); San Francisco, 51½c; Mexican dollars, 44½c San Francisco, 41½c New York.

COPPER. — New York: Standard, $11.65@12 00; Lake, 1 to 3 casks, $12.25; carload lots, $12.00; Electrolytic, 1 to 3 casks, $12.00; carload lots, $11.75; Casting, 1 to 3 casks, $12.50; carload lots, $11.50. San Francisco: $14.00. Mill copper plates, $17.00; bars, 18@24c. London: £54 5s per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £11 12s 6d per ton.

SPELTER. — New York, $4.45; St. Louis, $4.00; London, £18 10s per ton; San Francisco, ton lots, 5½c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN. — New York, pig, $29.00: San Francisco, ton lots, 31½c; 1000 lbs., 31⅝c; 500 lbs., 31¾c; 200 lbs., 32½c; less, 31c; bar tin, ℔ lb, 37½c.

PLATINUM.—San Francisco, crude, $17 ℔ oz.; New York, $18 per Troy oz

QUICKSILVER. — New York, $50.00 large lots; London, £8 15s; San Francisco. local, $47.50 ℔ flask of 76½ lbs.; Denver, $51.00. Export, $45.00.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots 20c; San Francisco, Plumbers', 100-lb. lots, 17½c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18 00; gray forge, $18.50; San Francisco, bar, 2.75 ℔ lb .,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $32 00; open hearth billets, $32.50; San Francisco, bar, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per bbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19 50; extra sizes higher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19.00; shingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d. Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No. 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11.75, long ton.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2½@3c ℔ lb.; blue vitriol, 5½@6½c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2½@2½c; California refined, 1½@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 76c; cs., 81c; raw, bbl., 74c; cs., 79c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 66c; cs, 71c; raw, bbl., 64c; cs, 69c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13½c; Mineral Seal, iron bbls, 19c; wooden bbls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 15½c; do., cs., 21½c; 86° Gasoline, bulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 20½c; Lard Oil, No. 1 bbl., 60c; cs., 65c; Neatsfoot Oil, bbl., 70c; cs., 72½c; No. 1 bbl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¼c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb, 7¼c; less than 500 lbs., per lb., 7½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¾c; do. in kegs, 7¼c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb, 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c.

ASSAY LITHARGE.—Per lb., 9c.

BISMUTH.—Subnitrate, per lb., $1.60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c: calcined, 20c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2¼ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING MAY 6, 1902.

699,450.—CORRECTINO COMPASS ERRORS—J. Christensen, S. F.

699,451.—STEERINO MECHANISM—J. Christensen, S. F.

699,454.—CULTIVATOR—F. D. Cook, Terminus, Cal.

699,497.—WASTE PIPE CONNECTION—A. Dellsmore, Los Angeles, Cal.

699,374.—LADDER—Edmison & Myers, Spokane, Wash.

699,380.—OIL BURNER—R. H. Fullaway, Los Angeles, Cal.

699,513.—APRON—W. Garms, Los Angeles, Cal.

699,519.—BOOT HEEL—M. L. Hansen, Oakland, Cal.

699,468.—SIDEWALK TRAP DOOR—P. H. Jackson, S. F.

699,395.—PROTECTING DYKES—W. S. Keyes, S. F.

699,226.—FRUIT COVER—E. Nyswonger, Hanford, Cal.

699,635.—CREMATORY—R. Robinson, Portland, Or.

699,417.—SHIPPING PACKAGE—G. F. Samberg, S. F.

699 418.—EGO SAFE—R. B. Sears, Secramento, Cal.

699,583.—MOTOR VEHICLES—H. H. Sherk, Pasadena, Cal.

699,386.—FUSE CAP—C. E. Stevens, Lovelocks, Nev.

699,351.—WATER MOTOR—G. E. Thurston, Colby, Wash.

699,431.—MAIL POUCH—H. D. Weller, San Jose, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

CONCENTRATOR. — No. 698,737. April 29, 1902. M. D. Rcobford, Kingmsn, Arlz. This devlce is designed for the seperatlon of veluable heavy and preclous metals and sulphurets from sand and tailings. It consists of a table having along one side a concentrate trough and superposed water supply pipe, and on another portion a line of riffles extending transversely and tapering in the direction of their length to form central portions of greater thickness than the ends so that the material at the ends of the riffles is agitated with greater effect than that of the thickened center, and a deflecting surface extending in line with the trough and below the water supply pipe and rising from the table in a series of independent and gradual curves.

DOUGH MANIPULATING AND LOAF FORMINO MACHINE.—No. 698,814. April 29, 1002. E. C. Chase and I. E. Rickey, San Francisco, Cal. This apparatus is designed to manipulate dough and to fold it into the form of loaves and deliver it in readineee for the oven. It comprises rollers, endless traveling belts, with reciprocating cutting and stamping devices whereby the dough is rolled into sheets of even thickness, the edges folded over to counteract the transverse stretch, and the sheet folded lengthwise by successive operations and cut into proper lengths, then pressed into required form for loaves. The loaves are then delivered upon carriers with folds of cloth in between them to prevent contact.

EXTRACTION OF METALS FROM ORE AND THE LIKE.—No. 699,108. April 29, 1902. B. Hunt, San Francisco, Cal. This invention has for its object the treatment of ores containing gold, silver, copper, zinc, nickel, etc., in a single operation. It is especially applicable to such ores when containing a relatively small amount of copper, zinc or base metals which prevents their successful treatment by the ordinary cyanide process. The invention and process consist in leaching the ores or tailings with a solution containing a quantity of free ammonia and a quantity of cyanide.

SIDEWALK TRAP DOORS.—No. 699,468. May 6, 1902. P. H. Jackson, San Francisco, Cal. The object of this invention is to provide improvements in that class of sidewalk trap doors having stairs which lead from the sidewalk into the basement, which stairs are normally covered with hinged closable doors. It consists of a means for supporting the rear ends of the doors by a bar carried and movable with one of the doors, the supports for the ends of the bar when the doors are closed, a support for the meeting edges, means for preventing the entrance of water into the stairway through the joints between and around the doors, and means for conducting away the water which enters through such joints.

CULTIVATOR ATTACHMENT.—No. 699,454. May 6, 1902. F. D. Cook, Terminus, Cal. This improvement relates to cultivators and weeders such as are employed for cultivating the ground where corn, beets and like crops are planted in rows. It consists of a main plow frame, a supplemental lateral frame pivoted thereto carrying plows or shovels which are adjustable upon a frame, a segmentally flanged plate on the main frame which flange is concentric with the pivot of the clevis and means for uniting the clevis and flange so that the clevis may stand at any desired angle with relation to the axis of the cultivator, and a colter carried by the clevis.

METHOD OF PROTECTINO DIKES. — No. 699,395. May 6, 1902. W. S. Keyes, San Francisco, Cal. The object of this invention is to protect dikes, levees and like earth structures from the destructive burrowing influences of gophers, squirrels, etc., and at the same time to resist the action of the waves. It consists in coating the surfaces of said structures with crude petroleum or other hydrocarbon products to form a cruet or surface impermeable to the water and distasteful to the rodente.

EGO PRESERVINO SAFE. — No. 699,418. May 6, 1902. R. B. Sears, of Sacramento, Cal. Assigned to H. C. Muddox, of same place. In this invention an apparatus is provided to prevent the yolks of eggs from settling to one side where the eggs are stored in large quantities. It consists of a box having individual compartments for the eggs in which they are kept separate, and this box is so mounted that it can be revolved at intervals to present all sides of the eggs upward and prevent such settling; means are also provided for the introduction and circulation of cold air so as to reduce the temperature and maintain it at a low degree.

HYDRAULIC STEERING MECHANISM.—No. 699,451. May 6, 1902. J. Christensen, San Francisco, Cal. This invention is designed to relieve the steering gear of a ship of the sudden strains and shocks to which it is subjected by the action of the waves upon the rudder, and to provide an automatically operating brake whereby the movement of the rudder is limited independently of the steersman. It consists of oscillating cylinders having their piston rods operatively connected with the rudder stock, and communications between said cylinders and a source of supply. A slide valve admits the fluid employed to the cylinders and is controlled by a rod attached to the valve. A short lever to which the other end of the rod is pivoted is connected with a resiliently supported and slidable block, a tiller wheel is fixed upon the shaft and connections are made between the lever and the wheel whereby the lever may be actuated to operate the valve by the movement of the wheel. A tripping device is operated by the movement of the rudder and adapted to engage the block when the rudder is swung a certain distance in either direction and this moves the valve independently of the operation of the tiller and automatically checks the flow of the fluid to the cylinders.

DEVICE FOR CORRECTING COMPASS ERRORS.—No. 699,450. May 6, 1902. J. Christensen, San Francisco, Cal. This invention is designed to correct compass errors of any description which may arise either from the character of the cargo, or from exterior sources. It consists of a ring having points of compass and degrees marked upon it, and an exterior support in which the ring is turnable, this support being suspended and counterweighted so that it retains its horizontal position at all times. Within the compass ring another ring is fitted and turnable independently thereof, and within this ring is a peculiarly subdivided clock face pivoted and turnable to give it any angle of inclination relative to the horizon, and a graduated arc shows the angle of elevation. Across the axis of the top face an arm or needle extends which is turnable about its axis in a plane parallel to the clock face. This forms an indicator with relation to the subdivisions of the clock face and a perpendicular shadow pin is provided with a plate upon which the shadow of the pin is cast. The compass error is marked by a pointer movable with the clock face and over the compass marked ring.

MAIL POUCH ADDRESS AND FASTENING ATTACHMENT.—No. 699,431. May 6, 1902. H. D. Weller, San Jose, Cal. Three-fourths assigned to W. G. Hawley and H. P. Laronette, of same place. In this invention the mail pouch has a lock permanently secured to the flap having an end opening, and a strap has one end secured to the flap. A channeled plate is secured to the free end of the flap having a bolt projecting to its front end, the under side of said bolt forming the top wall of said channel whereby the address card or label is inserted from beneath the bolt and its end protected by the overhanging bolt. The end of the card or label is in line with the solid wall of the lock below the opening.

SITUATIONS WANTED.

CHEMIST AND ASSAYER, WITH TWENTY years' experience in mill and smelter work. Can run same. Address A. C., care of Mining and Scientific Press.

THUNDER MOUNTAIN.—A successful superintendent of over 15 years' experience and acquainted with this district, desires to take charge of property there for a good company. Address T. M., care of Mining and Scientific Press.

OPEN FOR A PROPOSITION TO PROSPECT, east, west, north or south. Thoroughly understands mining, also mining laws. Have a good prospecting outfit. Address R. H. J., care of Mining and Scientific Press.

WANTED.—Position as Foreman or Superintendent of quartz proposition or developed mine. Timbering and air machine drilling a specialty. Sixteen years' experience. No fake references furnished. Correspondence solicited. Present position not desirable. Address T. J. P., care of Mining and Scientific Press.

MINING ENGINEER, practical miner and mill man, assayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best references. Now working in southern California. Address A. M. P., care of Mining and Scientific Press.

WANTED.—SITUATION AFTER MARCH 15, 1902, as Manager or Superintendent of mine. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work. Four years' experience as manager and superintendent. Treatment of low grade ores a specialty. Practical in every detail. State location of mine and salary. Best of references. Address X. Y. Z., this office.

A technically educated Mining Engineer, at present employed as superintendent of mines for one of the largest corporations in Mexico, desires a change of position to the United States about July 1st. Has had 18 years' successful experience as engineer and superintendent, never having made a failure; 36 years of age; strictly temperate; a skilled designer, geologist and metallurgist, and a practical miner, as well as a hard worker and thorough business man. References of the highest order, including present employers. Address Supt., care this office.

EXAMINATION OR SUPERVISION of Mines, Smelters and Mills.

Mining Engineer and Metallurgist, of unquestionable reputation and long experience, now permanently residing at Seattle, Wash., will examine or take general supervision of mines, smelters or mills, in Pacific Coast States, British Columbia or Alaska, as consulting engineer, for reliable parties. Is also reliable accountant to examine. Box 813, Seattle.

Quicksilver

BY THE FLASK OR CARLOAD.
WEIGHT AND QUALITY GUARANTEED.
The Eureka Company,
OF SAN FRANCISCO.
320 SANSOME STREET, - SAN FRANCISCO.

Quicksilver

IN LOTS TO SUIT.
Write for Quotations.
REDINGTON & CO., 23-25-27 Second Street, SAN FRANCISCO, CAL.

WANTED.

Mine Blacksmith and Drill Sharpener to go to Hawaiian Islands—18 months. Unmarried man preferred; sober. Apply by letter, with testimonials, to D. Y. Z., this office.

Wanted to Bond a Dry Placer Claim, One Rich in Flour Gold.

Must be a dry proposition. Address "Placer Claim," care this office.

WANTED TO BUY:

Interest in or all of a going Sampling Works, Ore Business, or Smelting Works. Address with particulars, L. X. D., Mining and Scientific Press, 330 Market St., San Francisco, Cal.

Mine foreman, having practical experience with Arizona copper deposit, understanding the handling of men in a large property, sober and industrious. Best of references required. Wages $6.00 per day. Apply in writing. Address "Copper Sulphide," care Mining and Scientific Press.

WANTED, for a developed mine in California, a competent mining engineer to look after development and exploration. Must be a full graduate of a recognized mining college and have had several years' practical experience in large iron, coal or copper mines, and be fully skilled in the engineering problems pertaining to extraction, haulage, ventilation, etc. Give full particulars of career, experience, age, etc., to "Vulcan," care of this paper.

A practical smelterman and metallurgist wanted, competent to handle a 250-ton matting plant, sulphide ore, in Arizona. Good opening for right party. State fully past experience and references.
Address "Matting," care of Mining and Scientific Press.

WANTED.

Consulting Mining Engineer,

familiar with making examinations of mines, prospects and mineral lands. Address stating experience and references. Moderate salary to start, with advancement to competent man. Position permanent if found satisfactory. Address A., care of Mining and Scientific Press.

STAMP MILL WANTED,

either ten or twenty stamps, second hand, as near Amador County, California, as possible. Must be in good condition, and low as to price—advertiser has himself built mills and then tried to sell, so don't quote fancy figures. Water-power mill preferred; steam no objection, however. Give full details, price, location, condition. Concentrators acceptable if with plant. Will also buy small boiler and any good second hand mine equipment. Address E. N. DARLING, 9 Pine St., New York.

WANT TO INTEREST PARTIES

in group of mines (70 acres) working under bond and lease, profitably shipping 160 tons per month of lead ores. Have developed large reserves of excellent carbonate and sulphide ores of the best of concentrating material. Mill and lead smelter near mine. Will stand a rigid examination.

Address DAN C. TOBIN,
White Pine, Gunnison Co., Colo

Wanted, Capital

to develop a group of mining claims recently discovered in northern California. Six lode locations from 10 to 30 feet in width, carrying gold, silver and copper.
For further particulars, apply to

AUGUST QUITZOW,
CRESCENT CITY, CAL.

HENRY CAREY BAIRD & CO.,
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS,
810 Walnut St., Philadelphia, Pa., U. S. A.

Our New and Revised Catalogue of Practical and Scientific Books, 92 pages, 8vo.; a Catalogue of Books on Metallurgy, Mining, Prospecting, Mineralogy, Geology, Assaying, Analysis, etc.; a Catalogue of Books on Steam and the Steam Engine, Machinery, etc.; a Catalogue of Books on Sanitary Science, Gas Fitting, Plumbing, etc., and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

FOR SALE.

Gold Mining Properties For Sale.

Two First-Class Placer Mines,

one having 20 years' record as a producer. Both in good working condition. Terms reasonable.
Address "Enquire," care this office.

The Mines Exchange, Ltd.

Mines and prospects in British Columbia, the Western States, and Mexico, for sale.
Free milling gold properties a specialty.
Write us for reports and information.
Bank references given.
Address THE MINES EXCHANGE, LTD.,
P. O. Box 700, Nelson, B. C.
Branch Office: P. O. Box 594, Salmon City, Idaho.

$158\frac{42}{100}$ Acres of Dredging Property for Sale.

Best location for dredger. Two power lines within ¾ mile. Blueprints furnished to reliable parties, so no agents need apply. Nearest working dredge 1 mile. One building within ¾ mile.
For particulars, address J. H. G. H., Chardon, Butte Co., Cal.

FOR SALE.

Three patented and joining placer claims with seven (7000) thousand tons or more of tailings, having an average assay value of five ($5.00) dollars per ton in gold.
Price, five thousand ($5,000.00) dollars.
For particulars, address

JOHN P. SCHMIT,
Helena, Montana.

FOR SALE.

ONE HEINE BOILER.

Five miles from R. R.; built 1896; used only four months, with wood fire; sixty-seven 3¼-inch tubes, 17 feet long, with fittings, and 85 feet of 3-foot smokestack.
For terms and particulars, apply to
L. J. HOHL, Cherokee, Butte Co., Cal.

ANNUAL MEETING.

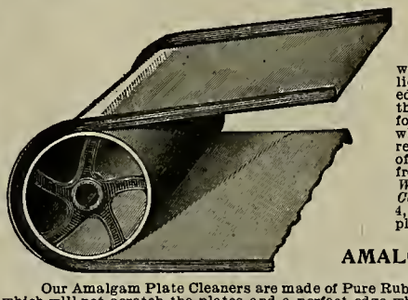
The Regular Annual Meeting of the Stockholders of the National Cons. Mining Company will be held at the office of the company, 773 Mission St., San Francisco, California, on MONDAY, the 2nd day of June, 1902, at the hour of 8 o'clock P. M., for the purpose of electing a Board of Directors to serve for the ensuing year, and the transaction of such other business as may come before the meeting.
GEO. W. FLEISSNER, Secretary.
Office—773 Mission St., San Francisco, California.

Lemhi Mining and Real Estate Exchange,

P. O. Box 165, SALMON CITY, IDAHO.
Thunder Mountain Properties a Specialty.
GOLD, SILVER AND COPPER QUARTZ MINES.
Contracts for Mills and Mining Plants.
Reports on Mines.

SPADONE'S CONCENTRATOR BELTS.

PATENTED.



This illustration shows the edge flanging outwardly as it passes over the pulley. This relieves the strain from the top and bottom of the edge by directing the strain automatically to the inside face surface of the edges. Heretofore all belts have been so constructed that when they pass over the pulleys or rolls, a direct strain comes upon the top or at the base of of the edges, causing the edges to break away from the body of the belts in a very short time. *We avoid this Mechanical Defect by our Spadone Curved Edge.* Belts made to fit any machine—4, 5 and 6 feet wide. Prices and samples on application.

AMALGAM PLATE CLEANERS.

Our Amalgam Plate Cleaners are made of Pure Rubber in moulds, thus insuring a plate cleaner which will not scratch the plates and a perfect edge which will clean the Amalgam plates evenly. They are made 6 inches long, 3 inches wide and ⅛ inch thick, making a convenient size to handle. Price by mail to any address, each 75 cents. Correspondence solicited.

Send me your order for Water, Air Drill, Steam, Suction and Fire HOSE, RUBBER BELTING, RUBBER PACKING and LEATHER BELTING.

THE GUTTA PERCHA RUBBER AND M'F'G CO.,
30 and 32 FREMONT STREET, Telephone Main 1813. SAN FRANCISCO, CAL.

URIE PATENT BOILER.

Adapted to all light service. Use less fuel. No small flues to clean. Strong and durable.
Write for prices, stating requirements. URIE BOILER & MACHINE CO., KANSAS CITY, MO.

MINING AND SCIENTIFIC PRESS.

Whole No. 2183.—VOLUME LXXXIV. Number 21. SAN FRANCISCO, CAL., SATURDAY, MAY 24, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Mine Head Gear.

Steel is fast superseding timber for mine head gear. The steel head frame of the High Ore mine at Butte, Mont., is illustrative of this newer style. The height of that frame is 100 feet to the center of the sheaves, base 38x65 feet. Timber, however, still holds its own in many localities. The head gear or "gallows-frame" of the Wolftone shaft, Leadville, Colo., illustrated, is built of redwood, is 82 feet high, main timbers not mortised, but bolted. The two-post frame at the Potosi mine, Coulterville, Cal., is easy to build and of use in the first stages of mine development. The 4-foot frame is, however, more indigenous to California. A new wrinkle in such construction is shown in the engraving of the one over the Fremont, Amador City, Cal. In this the old angle braces have been omitted. The two-post head frame at Cripple Creek, Colo., shows that in building that style of head gear the side braces tend to give it greater rigidity, and the tieing iron rods to keep it from swaying. The frame of the Oneida, Cal., has no superfluous material; the manifest intent in jointing it was to equalize and distribute the strain occasioned in any deep shaft from which heavy loads are quickly hoisted.

Head Gear Wolfetone Shaft, Leadville, Colo.

Head Gear Oneida Shaft, Amador, Cal.

Head Gear Malvina-Potosi Shaft, Coulterville, Cal.

Steel Head Gear, High Ore Mine, Butte, Mont.

Head Gear, Cripple Creek, Colo.

MINE HEAD GEAR, COLORADO, MONTANA AND CALIFORNIA MINES.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

Chicago Office.....737 Monadnock Blk.
Denver Office.....606 Mack Blk.

J. F. HALLORAN.....Publisher.

San Francisco, May 24, 1902.

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THERE is a concordance between theory and practice, or theory and fact. There can be no antagonism, for the theory can only result from correct understanding of the facts that create the theory. When apparent antagonism exists, it is because the facts have not been correctly noted, or else the theory is incomplete. All this is better understood if it be kept in mind that facts always precede theory.

MORE than a year ago the U. S. Government created a national bureau of standards. Its work is now going on at Washington, D. C., and consists mostly in comparison of standards used in science, engineering, manufacturing and commerce; the construction of standards where necessary, the testing of measuring apparatus and the determination of the properties of materials. The need of such action has long been manifest and the economy of the measure is already apparent.

SOME zinc ores contain small quantities of tin. If present to the amount of 1%, the metal is brittle and unfit for rolling. Small quantities of arsenic and antimony are frequently found in commercial zinc, but they have no apparent effect upon the properties of the metal. Sulphur or copper are seldom present. Zinc precipitates all the heavy metals, except iron and nickel, from their solutions in the metallic state. Zinc is not precipitated from its solutions in the metallic state by any metal which is stable in the air at ordinary temperatures.

THROUGH the years the advertisements have been preserved in the bound volumes of this paper, and it is of interest in connection therewith to note the fact that in many of those old volumes, as in more recent ones, the advertisements are the most interesting part of the contents. It is further to be noted that ofttimes those advertisements establish the date of introduction of some important mining or metallurgical improvement. Taken altogether, the eighty-five volumes of this paper contain a compendium of modern mining and scientific progress.

THE statement is made that W. A. Clark of Arizona and Montana "draws a check on the first of every month for $900,000, for the contractors who are building his Western railroad," and that "these checks do not decrease his capital; they are drawn upon his income account." Very likely; it is only a miner who can ordinarily do those things, and the matter illustrates how it is that miners and the result of their mining have developed and are exploiting the great empire comprised in the area from the 100th meridian westward. The miner has done more and got less from the federal government than any other representative of any creative industry.

THE U. S. General Land Office announces that there is no authority of law for changing the courses of patented claims in making survey for patent of adjacent grounds, and that the lines of the subsequent survey must be made to conform to those of the already patented claim, which must be recognized as covering the ground for which patent has issued. It is stated that if errors exist in mineral patents the only relief is to surrender the erroneous patent and to have made a correct survey, describing the ground intended to be covered.

THE value of waterfalls has greatly increased since the electrical era. Time was when a cataract was valuable only for scenic purposes, but now it is useful as well as ornamental. Niagara is worth one thousand million dollars more as a source of electrical power than merely as a sight. California waterfalls are increasing in value in a commensurate degree. Snoqualmie Falls, in Washington, has enhanced in value 5000% in the last few years. A proposition is now under way to generate electricity therefrom for use over a portion of the Great Northern Railway.

NEXT in value to such a journal as this the catalogues or trade treatises now being issued by manufacturers of mining machinery and appliances are of greatest worth to the mining public. Their contents are better and more practical than the ordinary technical text-book, and the presentation of the subjects treated are plain and clear. The typographical excellence of those trade treatises is also notable. While primarily those "catalogues" are for advertising purposes only, yet the progressive commercial spirit of their compilers has made them works of art, worthy of preservation.

COMPLAINT is made that in two California and Colorado instances cited the men who draw big mine dividends take the money elsewhere to live in luxury thereon. While, as a general proposition, a man has a right to do what he likes with his own, if he harms no other in so doing, yet, in the instances referred to the most of the prospecting and developing work in the districts mentioned is done with the money that comes out of those very dividend-paying mines. And this is often the case that apart from labor and supplies considerable of the money taken out of the ground is put back again in development work. Indeed, it is largely thus that mines are made. There is probably a less percentage of this "absentee landlordism" in mining than in any other occupation.

IN the hydroleum system of burning liquid fuel, all descriptions of liquid hydrocarbons, from petroleum to tar, are consumed with entire absence of smell or smoke. The burner comprises a combined feed of steam and oil, or oil refuse, and the vapor of these two is concentrated upon an incandescent firebrick, upon striking which the combined steam, by means of the intense heat, is divided into oxygen and hydrogen and passed through the boiler. So perfect is the combustion and so intense the heat that is generated that considerable economy is effected. By the system, fifteen pounds of water are evaporated by the consumption of one pound of tar refuse; with the same quantity of steam coal, only nine pounds of water are ordinarily evaporated.

A SUB-COMMITTEE of the U. S. Senate Committee on the Philippines has agreed upon a special code of mining laws for the islands. The best thing the Government can do at present is to let those matters alone, for they can adjust themselves much better than can be done by premature interference or control. But since the Government is assuming control of the mineral lands, as well as other resources of the Philippines, the conclusions of the sub-committee are to be heartily commended. This sensible sub-committee recommends that in the case of lode locations the side lines shall be vertical, and that only so much of the lode or vein as is contained within lines carried down vertically from the surface boundaries of the claim shall be controlled by the locator. This is as it should be, and it is to be hoped that that provision will have a majority vote in Congress. Were such a provision in the Federal statutes regarding continental mineral domain it would have saved much loss and litigation, but even in that far-off corner of our possessions it is well that common sense and twentieth century ideas have sway. The sub-committee in question is to be congratulated. It is the first time in many years that the Congress of the United States has shown the slightest correct understanding of the subject in attempting to deal with the mining industry.

AS A RULE, the information concerning the trials of steam generating apparatus is not complete; the composition of the gases is not often determined, although some of the testers make good use of gas analysis; but, so far as the writer knows, there is no published report of a trial where evidence was submitted that effort was made to attain maximum efficiency. In a speed trial of a steamship they are not satisfied to measure whatever speed may happen to be attained, but, on the contrary, do everything to make the ship go as fast as possible. And so with a generating apparatus; but the maker and the purchaser should be interested in its true efficiency, and not be satisfied with the uncertain performance which might result from unskillful operation. There is a disposition to decry what are called "fancy tests," and "expert firing," and to state that certain results were obtained with "ordinary firing," and with "common every-day practice," but common every day practice and ordinary firing may be such that a boiler will not make steam at all.

FORTY-TWO years ago to-day—May 24, 1860—appeared the first number of this paper. It has recorded the growth of the mineral development of this country, bas exercised a constant creative influence, and as the oldest journal of the kind on the continent takes pleasure in the consciousness of good work well done. Thousands of friends throughout the world will recall how through the years they have been pleased to commend its course. Rarely does this paper grow reminiscent. The horizon constantly widens and the future grows broader. Yet, occasionally, as in this paragraph, a milestone is marked in our progress. Through the years many journals with like aim and intent have sprung up—and passed away. This has kept on steadily and successfully for forty-two years, which is perhaps sufficient to say as to its worth and manifest value to readers and advertisers. Probably one element in its success is that it always aims to tell the truth and that it has never taken a dollar to put anything in its reading columns—or keep anything out.

A LETTER has come to this journal inquiring what is meant by the term "legitimate mining," which appears so freely in print—in some journals. The answer is that nothing is meant by the expression at all. It is meaningless. Mining is an industry neither prohibited by law nor the practice of a moral life. The qualification implied by the use of the adjective "legitimate" in connection with it is untrue. Tbe term as used is simply the evidence of the user's ignorance of mining and the pretense of an apology for his confession of the fact. Commonly, it is used to impress the careless reader with the writer's candor and truthfulness, on the theory that nothing is so deceiving as the truth well told and that ignorance to the ignorant is a virtue. There is good mining and bad mining. There are good mines and mines that are not so good. There are neither legitimate nor illegitimate mines, and neither legitimate nor illegitimate mining.

THE volume and fall of water in coast streams is a subject that is being given considerable deserved attention. Their utilization for electrical purposes is one of the foremost factors in present development. In this regard it is to be observed that the greatest accuracy and most complete detail is necessary in all experimental work with a view to determining practical value. Particularly is tbis the case in relation to the lessened summer flow. The minimum rather than the maximum flow should be the special object of information. While storage naturally enters into all final calculations, yet the costly experience with hastily constructed electrical work makes manifest the need of care and accuracy in all determinations of this kind where investment of capital is contemplated.

Concentrates.

STEAM of 100 pounds pressure has a temperature of 337.7° F.

AN electrical current cannot break through an insulation of ice.

IN the case of friction, the co-efficient of steel to ice is stated to be 0.02.

IF a well could be dug to a depth of 46 miles, the air at the bottom would be as dense as quicksilver.

THERE can be no federal tax or duty on any article exported from any State of the American Union.

CO-OWNERS in a mining claim have 180 days from the date of the first publication of their delinquency in which to pay up.

ACTINOLITE is not uncommon: it somewhat resembles asbestos, but has no fiber, and has little, if any, commercial value.

AT an altitude of 14,714 feet water boils at 85° C. At an elevation of 7500 feet the pressure of the atmosphere is about eleven pounds per square inch.

"MINING DIRECTORIES" are merely made to sell and are not designed or considered to be of any permanent value to others than the compiler and publisher.

IN Peru the Tarica mine is 11,466 feet above the sea and the smelting plant is 14,714 feet above sea level. It is 13 miles from Tarica. The road has a 12% grade.

WHERE not practicable to paint the iron pipe it can be kept from rusting by being painted with coal tar, then filled with light wooden shavings, the latter set on fire.

IRON combines with 53.3 parts of sulphur in 100, and is found abundantly in the carboniferous sulphur as a carbonate. Silver combines with 12.96 parts of sulphur in 100.

THE California Legislature passed a law in May, 1897, giving a mining claim locator sixty days in which to record the location. That law was repealed in February, 1899.

THE "free zone," sixty mile strip along the Mexican border, inwhich imported goods were allowed to enter for only a nominal duty, has been abolished by the Mexican Government.

THE founder of this paper was George H. Winslow. He leaped into San Francisco bay to rescue a child from drowning, sustaining injuries which resulted in his death, Jan. 18, 1864.

GOLD obtained by pulverization or disintegration of pyrites mixed with copper, zincblende and lead has a grayish-brown tint, is indifferent to the action of quicksilver, and will not amalgamate.

NINE MILLION ampere hours of current would be required to deposit one ton of copper on a single cathode surface. In practice many such surfaces are connected in series, thereby multiplying rate of deposition.

IN single leather belts it is calculated that 144 square feet of belt passing a given point per minute equals 1 H. P. A double belt is about 40% greater in power than a single belt of same width, but must have greater tension.

IF apertures of the same size and shape be located along a pipe at 1, 4, 9, 16, 25 feet, etc., below the surface, the relative velocity of the water flowing therefrom will be 1, 2, 3, 4, 5, etc., times the first velocity whatever that may be.

FOR a solvent for old paint or putty, mix soft soap with solution of potash or caustic soda: or pearl ash and slacked lime mixed with sufficient water to form a paste. Either applied and left for some hours will render the paint or putty easily removable.

IT is reasonable to believe that the modern roller bearing is capable of far higher speeds than ordinary journals, without undue wear or danger of heating, and without the necessity of those elaborate devices for supplying a continuous stream of oil.

THE characteristics of a high head plant differing from that of a low head plant is that the penstock, instead of being short, of large diameter and of low water velocity, is long, of comparatively small diameter, with the water velocity rising as high as 12 to 15 feet per second.

NO TAX upon mining claims can be laid that would be just in its burdens or equitable in its results. When the sagacity and toil, the anxiety and patience of the miner are rewarded with success, the results of that success become the subject of taxation and the source of State revenue.

IT is stated by those who claim to have demonstrated it by repeated experiment that if a plate of pure lead, about 3 inches in thickness, be placed on top of a plate of pure gold, that in three days samples from the top of the lead will show by analysis appreciable quantities of the gold—a case of interdiffusion.

THE mining term "wheal" prefixed to Cornish mines is a corruption of the word "huel," which means "mine." One of the oldest mines in Europe is Huelgoeth, near Poullaouen, Brittany, France, which shows by its Celtic name that it is a mine originally worked by the Goths, or Norman invaders of France.

MINING men visiting San Francisco, Denver or Chicago are invited to make use of our offices in those cities. Mail may be directed in care of any of these offices, papers examined and every facility afforded visitors. The San Francisco office is 330 Market street, the Denver office 606 Mack Building, corner 16th and California streets, and the Chicago office 737 Monadnock Block. In any of the three a courteous manager will attend to the wants of visitors.

PREVIOUS to any time of which there is a historical record, the whole Lake Superior region, including even the remote islands on the north shore, were mined over in, literally, thousands of places, shafts sunk through solid rock to the depth of 50 feet without the aid of steel or powder, and masses of copper raised of several tons weight.

THE term "horse power," as applied to motors of any kind, is deservedly becoming obsolete. The term arose when men began to supersede horse mills by steam mills. The manufacturer would naturally inquire of the party desiring a steam engine how many horses he wished to dispense with. The term has no proper place in twentieth century practice.

FOR lubricating the journals of heavy machinery, either rape or sperm oil is the best to use in admixture with mineral oil, as they have the least effect on brass and iron, which two metals usually constitute the bearing surface of an engine. Tallow oil, unless it is deacidized, should be used as little as possible, as it has considerable action on iron.

MERCURY is almost invariably sold pure. If the quicksilver is suspected of being adulterated with lead, tin or bismuth—which is extremely unlikely—such mixture can be shown by rubbing some of the metal on the open palm. If it soil the skin, it is adulterated; if pure, it leaves no trace. If dosed with lead, the drops, instead of being gobular, will be elongated and flattened.

WHERE necessary to solder full water pipes, that are broken off where it is inconvenient to turn off the water, put a plug in both broken ends; then surround the two portions of pipe near the fracture with ice and salt. When the water within the pipe is frozen solid the plugs may be withdrawn, the fracture repaired, the salt and ice removed and the water allowed to resume its flow.

IN intersections of veins the portion thrown out is on the side of an obtuse angle, and the more obtuse the greater the out-throw. In the question where the workings of a copper lode striking E. N. E. and dipping 80° N. N. W., are stopped by a cross vein striking N. 15° E., the obtuse angle being on the right of the lode as the miner drives north, southeast would be the course to find it again.

AFTER conducting a number of experiments and determining the advantages of looking after the small economies in mill operation, an engineer recommends the use of large pullies, fast running belts, plenty of the best oil, the preservation and purification of the drip, regular oiling of the shafting and careful and frequent inspection of line shafts, to see that they are in line and that they can be turned easily.

THE Schwarz process for desulphurizing coal difficult to coke consists in compressing the coal outside the oven, and again continually in the oven by means of heavy cast iron plates so that the coal undergoes the whole operation of transformation into coke under constant pressure, the object being to prevent a too rapid escape of the gases and to obtain a better fixing to the coal of the carbon of the portions susceptible of distillation.

THE size of a drop of liquid depends upon the chemical nature of the dropping liquid, and is not affected materially by its density. Water has the greatest and acetic acid the smallest drop size. The above rule holds good with solids. So far as observation goes antimony delivers the smallest and tin the largest drops. Temperature affects the size of the liquid drop; generally the higher the temperature the smaller the drop.

THE British Columbia "Legislature" defines a "mine" as follows: "Mine" means—A mine to which the "Inspection of Metalliferous Mines Act, 1897," and amending Acts apply, except as hereinafter stated, that is to say: This Act shall not apply to a prospect that is being developed or to a mine that has not a regular output of metalliferous product, unless more than twenty-five men are employed in the development of such prospect or mine.

IN France no mine can be opened without permission from the department of State charged with the supervision of mining affairs, and, if the permission be given and the work begun, it is done under the inspection and with the advice of graduates from the imperial school of mines, who are charged to see that no wasteful expenditures are made, no loss of life caused by ignorance or haste, and no imposition practiced on the public by false representations of what is going on.

THE Transvaal gold-bearing "reefs" are not quartz lodes, though composed entirely of quartz. They are bedded deposits of what was originally hard quartz gravel carrying fine placer gold. These beds, during the process of hardening into a compact rock, became subjected to what is described as the quartzite alteration, a metamorphic change made by the deposition of silica, or quartz, from the ascending saturations exactly as if it was in a fissure, by which the quartz pebbles became cemented together into a conglomerate.

SAND uniform and free from dust will flow in the air at angles above 32°, but not at smaller angles. Sand in a box or reservoir, allowed to flow through an aperture either in the bottom or side, will flow in the same quantity whatever the head or pressure may be, being thus unlike fluid. When a perpendicular tub is filled with sand very little of the weight is borne by the bottom of the tub; about as much as would equal the weight of a cone of sand standing on that bottom. The most of the weight is supported by the sides.

REVOLVING COLLARS for shaft bearings have been introduced into some leading machine shops. They consist of rings of metal, each made up of several segments, and great saving in lubricant is effected by their use. By having three or four such ring collars, working one within the other, well oiled, the surfaces brought into frictional contact by the turning of the central shaft, travel very slowly over one another, and the possibility of heating is reduced to its lowest.

THERE was as much gold extracted from the mines of the world within the ten years which followed the year 1848 as during the 366 preceding that date. During the three and one-half centuries which preceded the discovery of gold in California the whole amount of gold brought to the markets of Christendom was $2,000,000,000. At the beginning of the last century all the countries from which civilization drew its supply of gold produced annually about $17,000,000. California has produced about $1,200,000,000 in gold. The present gold yield of the world is about $400,000,000 annually.

THE trade journal is a tool of business. If the tool is poorly tempered, of weak constitution and untidy appearance, it will exert no influence, do more harm than good, turn traders into blunderers and live a short life. If, on the other hand, this tool of trade is well tempered, put together in attractive style, has force, a moral tone, and puts character first, it will live and thrive, and as it grows older exert more and more influence—secure respect for its opinion. The trade journal, then, to be a power, to have merit, to become a trader's aid, must be worth paying for. It must have individuality of its own, for in this world men count more than method.

AMONG the units of modern mining practice are: Attention to detail: the successful mine operator cannot afford to overlook any point where an economy can be effected or an improvement made. It is in making close propositions pay that stamps the genius of the management. Standardization: by this is meant a general uniformity of practice in every part of the mine. For instance, in the running of a drift or tunnel the timbering should be uniform, so that a stock cut to a standard size can always be kept on hand for use in any portion of the work. It is simply the system of interchanging parts in use in all manufacturing establishments applied to mining; application of the best mechanical practice to the machinery. The best plants and the best practice in their operation always pays in the long run.

TO DETERMINE the piston speed of a steam engine in the case of an ordinary engine taking steam on one end of the cylinder and then on the other, it is proper to take the piston speed for both strokes and for the number of revolutions made in one minute, for the horsepower of every engine is calculated on the basis of what it does in one minute of time. In the case of a 20x42-inch engine making 85 revolutions per minute, as it starts from the center and travels over to the other center it goes 42 inches or 3½ feet. As the piston comes to a full stop and then reverses its motion, it comes back to the place from which it started, making another stroke of 3½ feet, and this completes one revolution. It has traveled 7 feet, and as it does this 85 times each minute, multiply 85 by 7 and find that the speed is 595 feet. With a 16x20-inch engine running 150 revolutions per minute, the calculation is as follows: The travel is 40 inches which is 3⅓ feet for each revolution, and $150 \times 3\frac{1}{3} = 500$ feet per minute.

CONSIDERABLE inquiry comes as to the use of copper water-jackets, prompted doubtless by sundry statements in daily papers concerning the alleged use of all copper therefor at the Mountain Copper Co., Ltd, Keswick, Cal. The facts are as follows: They abandoned the use of built-up steel jackets in 1898, as they were too rapidly eaten out by the water they then had available for cooling purposes. For a time they used cast iron jackets which were partly satisfactory, but the cast iron jackets made in the Keswick foundry were particularly subject to cracking, so that they determined to find a cast iron that would be tougher and that would better resist sudden changes of temperature without cracking. As it takes a long while to make the jackets and get the test of time on them, it was decided, in the interim, to try cast copper jackets. It is commonly supposed to be impossible to get sound copper castings. After a little work the Keswick company found they could cast copper jackets sound enough for their purposes, and cast several, not in their ordinary foundry cupola, but from a reverberatory furnace. So far their special cast iron is satisfactory. The copper jackets have not yet been sufficiently tried but the experiment looks well. They have long used bronze for special water-jackets with success and continue to use that material for special work on account of its superior hardness. The Mountain Copper Co. are having better water than formerly and are now making another trial of wrought steel jackets. Thus they are trying three classes of metal. They want to see the copper succeed, believing it would be a safer material in case of an explosion. It would bend and bulge, not burst and scatter around like cast iron. Copper has long been used for water-jackets but it has been wrought copper built up. Copper jackets cast in one piece are deemed to be new.

Production of Rare Minerals.*

The manufacture of lithium carbonate has created within the last few years an unusual demand for lithium minerals, says Dr. Joseph Hyde Pratt in "Mineral Resources of the United States," 1901, now in press, published hy the United States Geological Survey; David T. Day, Chief of Division.

But two lithium minerals have thus far been mined—lepidolite, a lithia mica, and spodumene, a metasilicate of aluminum and lithium. The largest deposits of lepidolite in the United States are near Pala, San Diego county, California, and they were the only ones producing the mineral in 1901. On a neighhoring property, a large deposit of amhlygonite has heen discovered associated with the lepidolite and this amblygonite also may he used for the manufacture of lithium salts. The most noted occurrence of spodumene in quantity is at the Etta group of mines in the Black Hills of South Dakota. In this vicinity also the Sunday, the Golden Star, the Traction, and the Bob Ingersoll mines are known to contain spodumene in some quantity. It is not the natural lithium hut its salts, principally lithium carhonate, that are used in the arts, especially in preparing mineral water and lithia tablets. The production of lithium minerals in 1901, amounting to 1750 tons, valued at $43,200, was more than three times the production in 1900, ahout 520 tons. The average price received was $24.68 per ton. The highest price was for lepidolite. The California lepidolite was sent to New York, where a part of it was subjected to chemical treatment, and the remainder was shipped to Germany. None of the spodumene has been shipped ahroad. For years all the lithium minerals mined in this country were shipped to Germany, and the manufactured lithium salts then imported and sold at from $2 to $4 per pound. Now these salts are manufactured hy the Century Chemical Co., Camden, N. J., and the Eos Chemical Co., Rahway, N. J. There is talk of estahlishing a similar maufacturing plant on the Pacific coast.

MONAZITE.—The monazite industry of the United States, nearly at a standstill from 1896 to 1900 hecause of the Brazilian production, has heen revived, and is now a small but thriving industry in North Carolina.

Monazite is essentially an anhydrous phosphate of the rare earth minerals, cerium, lanthanum, and didymium. There is nearly always present a varying hut small percentage of thorium oxide, and this oxide gives monazite its commercial value. Monazite is found very widely distrihuted as an accessory constituent in varying proportions of many granites and their derived gneisses. Thus it is found in the Maritime mountains of Brazil, extending for 300 miles through the Provinces of Bahia, Minas-Geraes, Rio de Janeiro and Sao Paulo; and the South mountain region of North Carolina, covering the area of some 2000 square miles in McDowell, Burke, Rutherford, Cleveland, Polk, Catawha, Lincoln and Gaston counties, and extending into Spartanhurg and Greenville counties, South Carolina. Although occurring in hut small quantities, it has heen identified in the granites or gneisses of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, and Georgia. In North Carolina there are a numher of mica schists that carry monazite, as the mica schist near the Deake mica mine, Mitchell county, and at Milhholland's mill, Alexander county. The commercial deposits of monazite are not in the original rocks, hut occur in the placers of the present streams, and in the old sand and gravel deposits of former streams. The Brazilian deposits occur as beach sea sands, and their concentration has heen hrought about hy the action of the waves. In the Carolinas the workahle deposits of monazite sand are found along streams that have their sources in the South mountains, as Silver, South Muddy and North Muddy creeks, and Henrys and Jacohs forks of Catawha river, in Burke and McDowell counties; Second Broad river and its trihutaries in McDowell and Rutherford counties; First Broad river and its trihutaries in Rutherford and Cleveland counties, North Carolina, and in Spartanburg county, South Carolina. Associated with monazite in these sand deposits are zircon, garnet, magnetite, rutile and other minerals. Monazite is also reported from the gold placer deposits of the Glades, Hall county, Georgia and of the Oro Fino, Idaho. Monazite has also heen found in the pegmatitic dikes of southern Norway, and in the pegmatitic dike at Mars hill, Madison county, North Carolina.

Monazite is ohtained hy sluicing the sands and gravels, just as placer gold is washed. The resulting concentrates are then dried, and the minerals separated hy means of the electro-magnet; but the commercial sand thus obtained is not pure monazite. A company is erecting a mill near Shelby, Cleveland county, North Carolina, to treat the saprolitic rock containing monazite.

The economic value of monazite is dependent upon its containing the oxides of the rare earths, cerium, lanthanum, didymium, and of thorium, the last heing used with much smaller quantities of lanthanum and didymium in the manufacture of the cylindrical hood or mantle of the Welshach and other incandescent gaslights. The cerium oxalate ohtained is used in pharmacy. The monazite products of 1901 was 748,736 pounds, valued at $59,262, as compared with 908,000 pounds, valued at $48,805, in 1900, this increase of $10,457 in value with a decrease of 159,264 pounds in production being due partly to the cleaner condition of the sand produced. Representatives of German manufacturers are said to have hought recently monazite deposits in Cleveland county, North Carolina.

TUNGSTEN.—The metals tungsten, molyhdenum, uranium and vanadium are still attracting much interest in the steel industry, hecause of the heneficial properties which they impart to steel, although the alloys ferro-uranium and ferro-vanadium are still in experimental stage as to their actual commercial value; the ferro-alloys of molyhdenum and tungsten have passed this stage. The demand for tungsten has not increased during 1901, hut molyhdenum has heen greatly in demand, and its market value has remained nearly constant.

The sources of tungsten are the three minerals scheelite, wolframite and hubnerite, and of these scheelite, a tungstate of calcium, is the one that can he used in producing the metal, or ferro-alloy. Thus far scheelite has heen found in only one locality in the United States in sufficient quantity. Wolframite and hubnerite occur ahundantly, and the sources of supply greatly exceed the demand.

For a numher of years practically all the tungsten used in the United States was imported from England, Austria, Hungary, Saxony, Germany and Australia. The principal deposits in this country have heen found in Arizona, Nevada and Colorado. Deposits have also heen found in Oregon, Washington, Idaho, Montana, New Mexico, South Dakota, Connecticut and North Carolina. The Arizona deposits are in the Arivaca district, Pima county; in the Dragoon mountains, Cochise county, and 60 miles south of Hackherry, Mohave county. The Nevada deposits are near the base of Wheeler peak, in the South mountains, ahout 12 miles south of Osceola, White Pine county. The Colorado ores have been found in quantity in San Juan, Boulder, Gilpin, Ouray and Lake counties; the principal mines worked in 1901 being those in Boulder county, where the Great Western Exploration & Reduction Co. has been recently organized hoth to mine and reduce the ores and to manufacture ferro-tungsten alloy. The massive scheelite deposit in the Cliff mine in the Virtue district, east of Baker City, Oregon, carries considerable free gold. There has heen a little tungsten mining at the Harrison and the Durango mines in the North Lead district of South Dakota; and also at the scheelite mines of the American Tungsten Mining & Milling Co., near Long hill, Fairfield county, Connecticut.

Tungsten has been used for making colored cotton goods "fast" or washable, for rendering clothes noninflammahle, for the manufacture of stained papers, for coloring glass; as an alloy with copper and aluminum for the manufacture of propeller blades; as calcium tungstate in Roentgen ray apparatus. Now the chief use, either as ferro-tungsten or as the powdered metal, is in making tungsten steel. The production of tungsten ores during 1901 amounted to 179 tons, concentrated from 1221 short tons of crude ore, valued at $27,720, at an average price of $154.86 per ton. The price of tungsten ores has decreased from 50% to 75% during the last two years.

MOLYBDENUM.—Molyhdenum, found as the minerals molyhdenite and wulfenite, generally occurs in beds, or is disseminated through crystalline rocks, granite, gneiss, syenite and granular limestone. It has been found ahundantly in many localities, as in California, in Mono county, 12 miles northwest of Bridgeport, on the west fork of Walker river, where the molybdenite core is about 20 feet in diameter; on Alamo mountain, in northeastern Ventura county, where the vein is said to be from 8 to 15 feet wide. In Washington, molybdenite deposits are worked hy the Crown Point Mining Co., of Seattle, on Railroad creek in the Stehekin mining district, in western Chelan county. This deposit is associated with gold, silver and copper ores, and is in quantity. In Montana, at the Leslie copper mine, in Missoula county, molyhdenite was found in quantity in the upper parts of the mine. In Utah, molybdenite deposits have heen discovered near Leamington, Millard county, hut not sufficient development work has yet been done to determine their extent. In Arizona a vein of molybdenite 5 feet wide is reported in the Santa Rita mountain district, Pima county. In New Mexico, molyhdenite is reported in quantity ahout 25 miles from East Las Vegas, San Miguel county. It is also reported in quantity near Portage, Aitkin county, Minnesota, and near Cripple creek, Colorada. A deposit of molyhdenite of good indications has heen developed near Skaguay, Alaska.

The chief uses of molybdenum until recently have heen in determining phosphoric acid hy ammonium molyhdate, and in preparing "blue carmine" for coloring porcelain. The ferro-alloy of molyhdenum is now used in making a special steel, to which it gives valuable properties. The production of molyhdenite in the United States in 1901 has probably not been over ten or fifteen tons, which does not supply the demand. The ore, to be marketable, must contain over 45% of molybdenum and he free from copper. The average price of a 50% to 55% ore is prohahly ahout $400 a ton. The increase in the domestic production of 1902 over 1901 should be large.

URANIUM AND VANADIUM.—During the last few years there has been some demand for these metals for experimental work as to their heneficial effect upon steel. Uranium is found in the forms uraninite, gummite and carnotite. The principal occurrences of uraninite are at the Wood, the Black Hawk, and the Kirk mines near Central City, Gilpin county, and on Dolores river at the mouth of Disappointment creek, Montezuma county, Colorado. It has also heen found on the eastern slopes of Paradox valley, Montrose county, Colorado. It has been found in douhtful quantity in the Ross Hannihal mine in the Ruhy basin of the Black Hills, South Dakota; in the President mine, near Elizabethtown, Colfax county, New Mexico; and, with gummite also, in some of the pegmatitic dikes of Mitchell county, N. C.

Carnotite, which contains the oxides of both uranium and vanadium, occurs at La Salle creek, 6 miles from Cashin, Montrose county, Colorado; and it is reported from the western slopes of the La Salle mountains in southeastern Utah.

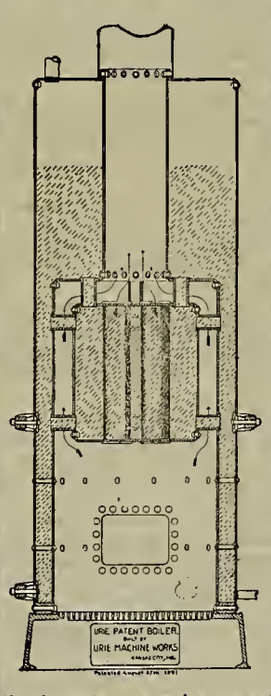
The other principal source of vanadium is canadinite, which has been found in some quantity at the Vulture and the Phœnix mines in Maricopa county, and at the Mammoth mine, near Oracle, Pinal county, Arizona; and at Lake valley, Sierra county, and at the Mimbres mines, near Georgetown, Grant county, New Mexico. Vanadium has heen ohtained from certain slags at Creusot, France; and it has also been found in the ash of certain coals—a source that is attracting the interest of manufacturers and chemists.

Both uranium and vanadium, as ferro-alloys, increase to a remarkable degree the tensile strength and toughness of steel, though no commercial steel seems thus far to have heen made with them. Uranium compounds are used in manufacturing and decorating porcelain and glass, and canadium is used for vanadium hronze in the place of gold bronze. The production of uranium and vanadium minerals during 1901, confined for the most part to Colorado, amounted to ahout 375 short tons of the crude ore. The highest recorded price for the crude ore was $150 per ton; uranium oxide has been sold as high as $1.20 per pound.

*From "Production and Distribution of Lithium, Monazite, Tungsten, Molybdenum, Uranium and Vanadium in 1901," in Advance Sheets of "Mineral Resources of the United States, 1901."

The Urie Vertical Boiler.

Herewith is illustrated the Urie vertical hoiler, made and supplied hy the Urie Boiler & Machine Co., 601-609 West 5th St., Kansas City, Mo. The manufacturers issue a circular in which, among other things, they say that the hoiler is made of flange steel throughout, has no flues to clean, has perfect draught and will burn lowest grade of slack coal; the boiler is especially adapted to steam and hot water heating and general steam use, owing to the little floor space they occupy. "Our heat is uniform throughout the hoilers. We have one of these boilers (20 H. P.) in operation now in our shops. Our coal hill for six months averaged 34 cents per day. We have three times the firehox room. The water magazine in firehox causes great circulation of water and discharges all the sediment in outer shell of hoiler, where it can be hlown out. Owing to great circulation in water magazine, no sediment can settle; magazine keeps perfectly clean. Magazine is kept full with great hody of water, so that it cannot hurn out. We have many orders for these boilers to replace the common tubular hoiler, aud can give endorsements from those who have watched the working of our boiler. This hoiler, on a test made hy one of the most practical engineers in Kansas City, evaporated 8.44 pounds of water to 1 pound of slack coal."



AT Cerro del Pasco, Peru, a claim is limited to 275x550 feet and is usually worked like a stone quarry. A large open cut is made and then a slope is sunk on an incline of about 45°. In the foot or hottom of the incline steps are cut so that the miners can walk up and down. They carry the ore out in leather sacks. There is no waste to handle—the ore body being 1000 feet wide and 2 miles long.

Costs and Profits in Pyritic Smelting of Low-Grade Copper Ores.

NUMBER III.

Written for the MINING AND SCIENTIFIC PRESS by F. H. PRENTISS, E. M.

The profit per ton when half the first grade ore is concentrated and used as a flux (allowing 25% loss in the concentrating) is the sum of $8 28 (Col. 35) and $2.35 (Col. 38) and .32, making $10.95 per ton. The total profit, therefore, is:

One ton of the first grade ore	$ 8.60
One ton of the first grade ore	10.95
Two tons of the second grade ore	2.61
	2.61
Total	$24.77

Or dividing by 4 the average profit becomes $6.19. We have found the varying profits to be as follows:

	Per Ton Smeltd.	Per Ton Mined.
The ore smelted direct	$1.46	$1.46
The ore sorted, the first grade smelted and the second grade thrown on the dump	6.18	3.09
The first grade smelted and the second grade concentrated, briquetted and used as a partial flux	5.60	5.60
Only half of the first grade smelted direct, the balance being concentrated with the second grade so as to make a complete flux	6.19	6.19

It will be readily seen that with more careful sorting a still better profit could have been obtained, as it would not in practice be necessary to concentrate high-grade ore to obtain a flux; and if the concentrating loss falls only on low-grade ore, the net results will be higher.

The above figures show the necessity of carefully hand sorting and concentrating the ore.

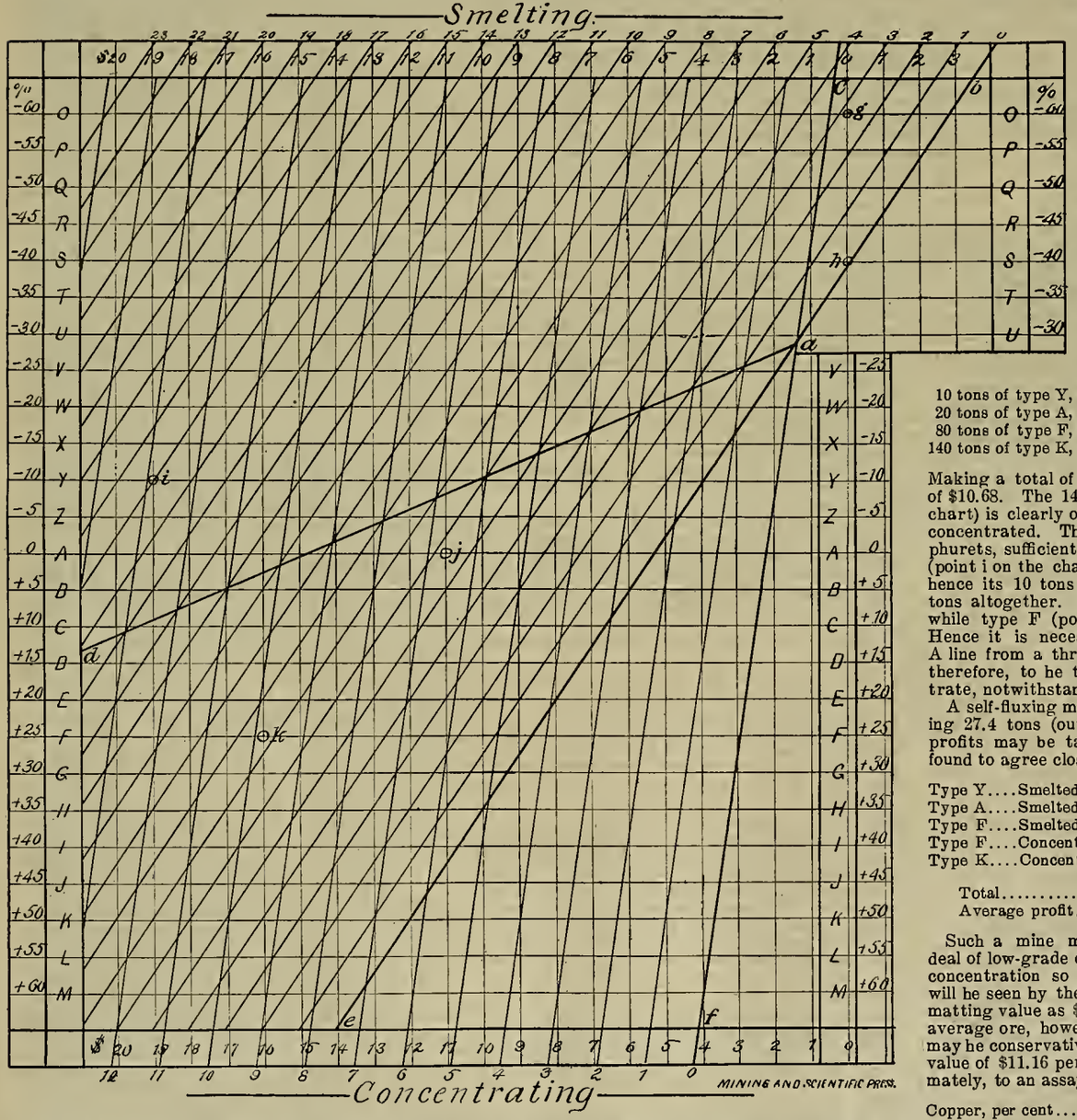
The ore should first be broken to a size suitable for smelting and the first grade sorted out by hand. The remainder should be broken to a smaller size and the best ore removed by jigging, the balance passing to the mills for fine crushing, and the sulphurets saved by concentrators and afterwards briquetted.

The types of ore A to K are those which carry more than silica enough (A being neutral) to flux the bases in the ore. The table below gives types which are deficient in silica. All ores of these types which have a matting value of $10 or over should be removed by jigging and added to the hand-selected ore.

TYPES OF ORE DEFICIENT IN SILICA TO MAKE A 50% SILICA SLAG.

Type.....	ANALYSIS OF ORE: SiO_2	Fe	S	Al_2O_3 CaO FeO MgO	Cu	Deficit of SiO_2.
	%	%	%	%	%	%
O	0	40	45	10	3	60
P	3	39	44	10	3	55
Q	6	37	42	10	3	50
R	9	36	41	10	3	45
S	12	34	39	10	3	40
T	15	32	37	10	3	35
U	18	31	36	10	3	30
V	21	30	34	10	3	25
W	24	28	32	10	3	20
X	27	27	31	10	3	15
Y	30	25	29	10	3	10
Z	33	24	27	10	3	5

In the accompanying chart the abscissæ A, A, B, B, etc., represent types of ore as given in table on page 255, and the numbers plus or minus 5, 10, etc., opposite each letter indicate the excess or deficit of silica (on the basis of a 50% silica slag). The ordinates represent the matting value in dollars per ton of the ore. The lines parallel to eb represent the profit per ton by smelting, and the lines parallel to cf the profit per ton by concentration prior to smelting. The chart is plotted from the preceding tables, and the loss in concentration is taken as 25%. All of the ore that comes within the space above and to the left of the lines da and ah should be smelted, as the profit will be greater than by concentrating.



Within this space comes the product of hand picking and of jigging. Similar ore may fall into the space between the lines da and ca, and such ore may be either smelted direct or concentrated prior to smelting, according to the needs of silica or iron for flux. Concentration will yield the most profit. The ore that falls between the lines ea and fa must be concentrated, as smelting will result in a clear loss. All ore that falls to the right of fab goes to the waste dump, as it cannot be worked at a profit. The line af, therefore, shows the division between valuable ore and waste, and where there is no further profit in concentrating.

It is evident that should the necessity exist for more concentrates for fluxing purposes, some of the ore which would fall on the waste dump side could be profitably sent through the mill, since it has already been charged with mining costs ($2.25+0.17) and could be credited back with that amount, as otherwise it would have to be charged back to the ore utilized.

The line ae shows the division where there is no further profit in smelting, and the line ad shows the division where it begins to be more profitable to concentrate than to smelt. The line ah is a continuation of ea, the line of no profit in smelting. It extends, however, into the space to the right of the ordinate marked zero—that is to say, beyond the point where the ore ceases to carry any gold, silver or copper. Ore of the types O, P, Q and R show, however, some profit notwithstanding. Type O (which has no silica at all) shows a profit by smelting even when its matting value is nothing (point g on the chart) of $2.80 per ton. This is its value as fuel and flux over and above the cost of mining. This is easily shown, since the ore contains 85% FeS_2 and 10% of other bases (CaO MgO, FeO Al_2O_3.) The FeS_2 is worth 5.7 cents per unit, or $4.84 per ton, and the 10% of bases are worth the cost of the limestone they replace—45 cents—making a total value of $5.29 per ton, from which there is to be deducted the cost of mining—$2.42—thus leaving $2.88 net, a practical agreement with the chart. Ore of type S carries 12% silica, and when it has no assay value (point h on the chart) the value of its FeS_2 is just sufficient to pay the cost of mining and smelting and leave no profit. This is shown on the chart by the intersection of the line of no profit eah with h.

To further illustrate the chart, suppose that the daily output of ore was:

10 tons of type Y, matting value	$19
20 tons of type A, matting value	11
80 tons of type F, matting valve	16
140 tons of type K, matting value	7

Making a total of 250 tons of average matting value of $10.68. The 140 tons of type K (point 1 on the chart) is clearly ore that has passed the jigs and is concentrated. This ore yields 14 tons available sulphurets, sufficient to flux 8.4 tons of silica. Type Y (point i on the chart) has 10% deficit of silica, and hence its 10 tons will flux 1 ton of silica, making 9.4 tons altogether. Type A (point j) is self-fluxing, while type F (point k) carries 25% excess silica. Hence it is necessary to obtain more sulphurets. A line from a through j shows k to fall below it and, therefore, to be the more desirable ore to concentrate, notwithstanding its higher assay value.

A self-fluxing mixture will be had by concentrating 27.4 tons (out of the 80 tons) of type F. The profits may be taken from the chart and will be found to agree closely with the tables.

Type Y....Smelted	10	tons at $14.95 =	$	149.50
Type A....Smelted	20	tons at 5.67 =		113.40
Type F....Smelted	52.6	tons at 7.27 =		382 40
Type F....Concentrated	27.4	tons at 9.80 =		268 50
Type K....Concentrated	140	tons at 2.60 =		364 00
Total				$1,277.80
Average profit				5.11

Such a mine may be found to carry a great deal of low-grade ore which will show good profit by concentration so long as a basic flux is needed. It will be seen by the tables that ores with as low a matting value as $3 per ton may be worked. The average ore, however, of the recognized ore bodies may be conservatively estimated as having a matting value of $11.16 per ton, which corresponds, approximately, to an assay:

Copper, per cent	3.00
Gold, dollars	4.25
Silver, ounces	2

For purposes of an approximate estimate let us suppose the ore divided into two grades, one having a matting value of $15 (type E) and the other a matting value of $10 (type K), in the proportion of 100 tons of the former to 330 tons of the latter. The sulphurets of the second grade ore would just about

flux the silica of the high-grade ore. The gross yield of this ore would be :

330 tons at $10	$3,300.00
100 tons at $15	1,500.00
Total	$4,800.00
Average value per ton	11.16

The expense of mining, concentrating and smelting would be as follows :

	Tons.		Cost.	
Mining	430	×	$2.25 =	$ 967.00
General expenses	430	×	.17 =	73.00
Hot blast	100	×	.58 =	58.00
Coke	100	×	.38 =	38.00
Labor, power, supplies, etc.	100	×	1.45 =	145.00
Concentrating	330	×	.50 =	165.00
Briquetting	42.5	×	2 00 =	85.00
Smelting loss	100	×	1 20 =	120.00
Concentrating loss	330	×	2.50 =	825.00
Total				$2,476.00
Net profit				$2,324.00
Or, per ton				5.40

The cost of coke would have been $140 (Col. 16, Type E), but the sulphurets saved $102 worth of coke (Col. 23, type K) .31 × 330 = $102, thus bringing the coke cost down to $38.

Approximately the same results may be obtained directly by the tables.

Type E (Col. 45) = 6.95 × 100 =	$ 695.00
Type K (Cols. 70 and 73) (6.98 — 2.07) × 330 =	1,620.00
Total profit	$2,315.00
Or, per ton	5.39

Distributing the cost of treatment over the entire 430 tons, the items of cost per ton are as follows :

Mining	$ 2.25
General expenses	.17
Hot blast	.13
Coke	.09
Labor, power, supplies, etc.	.34
Concentrating	.38
Briquetting	.20
Smelting loss	.28
Concentrating loss	1.92
Profit	5.40
Average value of ore	$11.16

The two items in the above list that catch the eye are the cost of mining and the heavy loss in concentrating. To reduce the latter to a minimum requires great care in first eliminating the high-grade ore by hand sorting and by jigging, and afterwards in treating the balance of the ore so as to produce the least amount of slimes. While iron pyrite is easily saved on a concentration table, the ores of copper (bornite, tetrahedrite, chalcocite, etc.) are apt to suffer a heavy loss in the slimes; but if these are kept small in amount they may be briquetted and part of the copper loss recovered. Although in the ore mixture selected for the above calculations no limestone was required for flux, a considerable quantity of quicklime was required for binding the briquettes, and undoubtedly for a long time in the beginning of the smelting work limestone flux will be needed. It will, therefore, probably pay the company to secure its own quarry, if one can be found reasonably near the mine. It will be seen that by means of the hot blast, and by using the sulphurets for flux and fuel, the cost of coke in the above example has been reduced to nearly nothing (9 cents per ton of ore mined), and with an abundance of sulphurets it would, of course, be possible to make a more ferruginous slag; but in this matter there must be considered the question as to what is the most advantageous point in practically working the furnace. The quality of the briquettes would have much to do with this. It is probable that a saving in the cost of the hot blast can be effected by using oil instead of wood.

Owing to the use of so large a quantity of briquettes and fines, rather more than ordinary attention will have to be paid to flue dust.

To treat the 430 tons of ore of the above example would require the smelting of 100 tons of the high-grade siliceous ore, together with 33 tons of sulphurets. This would require (using hot blast) 5880 cubic feet of air per minute (Col. 32, type E), and would require for 20-ounce pressure 40 H. P. (Col. 34).

The Root blower, which was ordered for this work, has a capacity of 5000 cubic feet, or 85% of this amount, and hence would be capable of smelting 85 tons of siliceous ore (of type E) and 28 tons of sulphurets from 280 tons of ore of type K—a total of ore mined of 365 tons. Of course, these figures will vary with the variation in the ore as the mine is developed.

If a cold blast were used (Col. 31), 5000 cubic feet capacity of blower would only smelt 56 tons of ore (type E) and 18.5 tons of sulphurets, or a total of 241 tons of ore mined. The deductions from the profits per ton on account of the less quantity of ore smelted would be for the cold blast (56 tons) 39 cents and for the hot blast (85 tons) 8 cents. And if we further consider the hot blast temperature 700° Fahr., instead of 1000° Fahr., the deduction becomes (type E) 13 cents more, thus making the deductions in smelting 56 tons of ore and 18.5 tons of concentrates with cold blast 56 × (39 + 58) ÷ 241 = 22 cents per ton of ore mined. The deduction in smelting the 85 tons with hot blast becomes (.08 + .13) × 85 ÷ 365 = 5 cents per ton of ore mined.

The desirability of producing high grade matte may be seen in the matter of transportation alone, as the matte must be sent to the Atlantic seaboard for treatment at a freight cost of about $20 per ton. This means 2 cents per pound of copper if the matte carries 50%, and 4 cents per pound of copper if only 25%.

This difference in the grade of the matte would mean on a 3% copper ore (3% recovery) a difference in profit of $1.20 per ton. In case sufficient sulphurets were not added to make the ore self-fluxing, and limestone and coke were used, the value of the iron and sulphur as flux and fuel would amount to 34 cents more, making the loss $1.54 per ton of ore, even on a grade as low as 3%.

The points requiring particular attention in operating the Valley View mine are the following :

1. Economical and methodical mining.
2. Careful hand sorting of ore.
3. Classification by jigging.
4. Special care in concentration and the avoidance of slimes.
5. The production of briquetted sulphurets in sufficient quantity to avoid the use of barren flux.
6. An efficient hot blast.
7. An adequate dust chamber.
8. The formation of a high-grade matte.

(TO BE CONTINUED.)

Compressed Air in Mining.*

By T. W. BARBER.

Compressed air, as employed in mining, is one of the very few sources of industrial power to which scarcely any exception can be taken. Its advantages —putting aside for a moment questions of comparative cost—are so very obvious that it seems almost loss of time to refer to them; yet it is still in its infancy. It has been in various half-hearted ways partially adopted as a mining motive power for, at least, fifty years past. The slow development of its usefulness is explainable on several grounds. Like every other motive power, it requires time to work out the best results. A good many mistakes have been made in installing it which have operated against it, and, lastly, the installers are not free from blame. Mining engineers, as a body, are practical men and not much given to studying theory. But mining, like other industrial enterprises, is fast becoming dependent upon advanced knowledge and ideas, for methods and appliances are fast coming into use which require something more than mere experience—which are, in fact, ahead of experience, and therefore demand insight and adaptability of a high order.

We propose to deal here with one only of these modern improvements—compressed air and its applications and advantages.

Its special advantages are:

1. It can be taken by pipes to any point and used there expansively, just the same as steam, and in the same engines.
2. The pipes and the air are cool and the air loses nothing by transmission, except by leakage and slight drop of pressure from friction in transit.
3. The exhaust is cold, invisible and wholesome, being free air at low temperature, which may be much below freezing point; a welcome help to ventilation.
4. The engines, being cool, are easy to lubricate and to handle.
5. The air does not corrode the pipes internally.
6. None of the compressing plant need be in the pit—in fact, it is almost always at bank.
7. The cost of it can be kept down easily to that of steam as a motive power, if properly installed.

Air is cheap as a motor fluid, and miners are always ready for any quantity of it; but, to use it economically, it must be compressed to about the same pressure as steam is ordinarily used. Sixty to eighty pounds per square inch are ordinary pressures which can be dealt with by the ordinary commercial engines without any special attachment or design. Steam, however, is now used at much higher pressures, 100 to 180 pounds, or more, being common. But such pressures in compressed air installations require extra strength in every part and greatly increase loss by leakage and condensation. In the case of air, the cost of compression and the loss of steam by heating of the air by compression increase very rapidly with the pressure. They require extra strength in the pipes and better joints also.

A compressed air plant consists of boilers, air compressing engines, receiver or air vessel, air mains, branch mains, pipes, valves and air engines.

The character and arrangements of the plant will depend much upon the kind of mine and the work to be done below. In many mines there is no rock work, but much hauling, and in many cases driving power is required for coal cutting machines, fans, etc.

In designing a compressed air plant the proper course to pursue is first to set out a list of all the motors required, their indicated horse power, the number of hours each is expected to be at work, whether continuously or at intervals. From this list the maximum horse power demanded at any one time can be deduced.

In estimating the maximum horse power, the character of the motors must be considered. Some engineers think that any kind of a rough-made, strong engine is good enough in a pit. But this is a serious error. A pit air motor ought to work with the highest possible economy. This is obtainable without any fancy expansion gearing or extensive and complicated valve gear, by using a cut-off slide valve. No engineer should be satisfied with an engine that will not work up to a six or ten-fold expansion. The saving in a good engine from this cause alone may amount to from 10% to 40%.

A high expansion, however, unless the air is heated, produces a very cold exhaust, and, unless the air is dry, the exhaust passage may get blocked with ice. This can be avoided by making these passages large, short and direct.

Having estimated the net maximum horse power required in the pit, a percentage must be added for leakages, which depends on the quality of the pipe joints, as to which any economy in fitting up is a very questionable gain, for a leak leaks twenty-four hours per day and carries off a proportionately large amount of air.

Air mains are frequently of great length; from 1 to 3 miles are common lengths. There must necessarily be some loss by leakage and friction in the mains in such long lengths, and it follows that great care is requisite in laying them. Every pipe should be tested. Settlement of ground is a fruitful cause of broken joints or pipes. A good joint should be flexible and not easily broken by expansion or contraction, due either to temperature or settlement.

If these points are satisfactorily dealt with, the loss by leakage should not exceed 1% per mile and the loss of pressure by friction 1½% per mile. Such results have been frequently attained, and the engineer should be satisfied with no less.

The diameter of the mains and distributing pipes is important and depends on two factors—the quantity of air passing and the distance from the compressor.

Where the compressing engines are of the wet type, a good deal of water is carried over with the air into the mains, and should be trapped out at a point not far from the engines. With the dry compressor there is always some amount of condensation, which should be drained from the main, as dry air is of advantage in the motors, especially if the air is not reheated. Moist air sometimes produces a good deal of ice at the exhaust.

The diameters of the mains depend upon the maximum quantity of air to be delivered, taking into consideration also the reduction in volume it sustains by cooling after passing the delivery valves. This varies between the isothermal and adiabatic lines of the air diagram and can be readily ascertained by computing the area of the diagram outside the isothermal line, as compared with the area of the whole diagram.

It may be assumed that the air will have cooled to atmospheric temperature in about fifteen minutes, more or less, according to its delivery temperature; therefore the point along the main at which it may be reduced to its minimum diameter can be easily found.

Expansion joints should be avoided as far as possible; their place can be taken by bends, or, better still, by a flexible form of packing rings or jointing.

The velocity of the air in the mains and branches should not exceed 40 feet per second.

Sluice valves are the best to use for all purposes on air mains. The compressor is the most important item of the installation. There are wet and dry compressors. The former uses an internal jet of water to cool the cylinder in conjunction with a water jacket and the latter a water jacket only.

Where a jet is used it should be forced in by a pump during the latter part of the compression stroke, or it will be quite ineffective. Its value in cooling is doubtful, while its destructive action in the cylinder and piston admits of no doubt whatever. By all means use a dry compressor and take the inlet air direct from outside the engine house—that is, as cold as possible. This can be done by using a wood or sheet iron air trunk to the inlet valves.

It must be remembered that every degree gained in low temperature at the inlet means several degrees gained at the delivery and that the engine room air is usually about 20° higher than outside.

Another important point is provision for utilizing the air in the clearances. The most simple and advantageous method of doing this is by the bye-pass method; ports of grooves are formed in the cylinder at each end a little longer than the thickness of the piston, so that at the end of the stroke these ports pass the air compressed in the clearances to the other side of the piston, where it adds to the initial pressure of the next compression stroke.

The inlet valve should have a positive movement, so as not to require suction to open it or pressure to close it, as both these cause loss of effective stroke and reduce the capacity of the cylinder.

A positive movement for the delivery valves is not so easy to design, as these valves should be open at the moment the pressure in the cylinder reaches that in the mains, whatever it may be. This may be at

*Condensed from Analyst.

any point in the stroke, as it is customary to use spring-loaded valves, lightly sprung and of special design. If too heavy, the diagram will show delivery line at top to he several pounds ahove the receiver or main pressure. This excess pressure is not all loss, hecause the air expands at the pressure in the mains, hut it increases the temperature which it is important to keep down.

Luhrication and its effectiveness depend upon the temperature, which in hadly designed engines often reaches 300° to 350°, at which point oil scorches and produces dry, hurnt surfaces and corrosion. Gas engine oil should he used. But, if proper attention has heen given to the foregoing points, the temperature at 60 pounds should not exceed 180°.

Good pistons, well fitted to the cylinder, are of more importance than in a steam cylinder; the ahsence of steam and its moisture causes drier surfaces, and much leakage may occur which is difficult to locate in the diagram, as it merely causes the compression line to approach the isothermal, giving a false impression of high efficiency.

But the chief loss in every compressor is that due to heating during compression.

The air, after passing the delivery valves, cools to atmospheric temperature, and loses in hulk proportionately, the loss varying, according to the pressure and other points previously alluded to, from 25% to 60%, and even more.

It is in this direction that the future improvement for air compressors must he aimed.

The latest designs are of the compound or stage compression type, in which the compound principle of the steam engine is reversed, the air is compressed in two or more stages, passing through cooling coils to chamhers hetween the stages. In this way the temperature can he kept down, hut the increase of economy is not in proportion; the mechanical efficiency of the engine is reduced, piston and other leakages and losses are duplicated, and thus the chief actual gain is in the lower temperature and better luhrication.

Stage compression diagrams do not show these losses and, to this extent, are misleading. The gain hy stage compression is chiefly in working at a lower temperature than in the single compressor.

It is evident that the stage compressor does not cool the air while under compression in the cylinder, hut in external coolers after it has passed the delivery valves, whereas the cooling ought to be done in the cylinder during compression.

We have shown that the efficiency of a compressed air plant depends upon a numher of small economies and attention to details, which, in fact, make all the difference hetween an efficient and a wasteful result.

There is another source of economy which has not yet made much progress, hut presents a very promising future—that is, reheating the air hefore losing it in the motors. At first sight, one would say that what is thus gained must he lost in cost of coal or other heating medium; hut this is by no means the case.

In practice, a very small quantity of coal will heat the air in a tuhular heater to 250° or 300°, hut it is not desirahle to heat heyond 300°, and to expand the air to more than douhle the original quantity, and thus similarly augment the useful effect in the motors, hesides which the exhaust is discharged at temperature ahove the atmosphere, and freezing is thus avoided. Actual tests of the heating in this way have shown that the efficiency of the entire plant can he hrought up to 100%—that is to say, as much work can he given out at the motors as is supplied to the compressor in steam energy.

Without reheating, a plant should show an efficiency of at least 50% to 55%.

There are several ways of reheating which are more or less applicahle to all cases. A furnace and coil or surface heater is the simplest, hut is inapplicahle in fiery mines. Where steam hoilers exist underground, steam pipes can he employed to reheat the air, the temperature ohtained heing of course not more than ahout 180°. A furnace or oil hurner has heen used inside the air main, the products of comhustion passing with the air to the motors. Some simple adaptation of this plan as an appliance attachahle to any motor seems to he the hest form capahle of universal application.

Reheating enahles the motors to run with a much higher grade of expansion than with cold air. With the latter we get in the motor a reversal of the effects of heating described as going on in the compressing cylinder—that is to say, we get adiabatic cooling instead of isothermal, the effect heing to reduce the pressure and volume of the air more rapidly than is due to its expansion only. Keeping the motor cylinder hot will remedy this and induce isothermal expansion.

ARIZONA has five railroad companies controlled hy operating mining companies, to wit: The United Verde, narrow gauge, 26 miles; Congress, standard gauge, 3 miles; El Paso & Southern, standard, Benson to El Paso, via Bishee and Douglas, 260 miles; Arizona & New Mexico, Clifton to Hachita, and its hranches; Arizona & New Mexico, Detroit Copper Company's Morenci to Guthrie, narrow gauge, 18 miles, with six loops in that distance.—Globe Silver Belt.

The Golden Gate Cyanide Plant.*

NUMBER II.—CONCLUDED.

The following tahle is a tabulation of the work of the mill on sands and dusts over a considerable period of time:

Lot Number.	Material.	Number of Tanks of Sands in 50-Ton Lots, Dust in 8-Ton Lots.	Average Value of Ore per Ton in Ounces Gold.	Average Extraction Made in Percentage, Determined on the Washed Tailings.	Average Percentage Saved; Determined on the Unwashed Tailings.	Average Time Consumed per Tank in Days.	Remarks.
1.	Sands	32	0.68	81.5	79.7	5.9	
2.	Sands	32	0.76	80.4	77.8	5.54	
3.	Sands	24	0.64	79.9	79.1	7.7	This lot was turned over in vats to aerate. (See text.)
4.	Sands	25	0.51	81.3	79.4	5.75	Moistened with 20% of a 5-lb. cyanide solution at bin.
5.	Dust.	36	1.18	89.6	86.2	4.4	
6.	Dust.	22	0.86	87.6	85.0	3.7	

REMARKS ON THE TABLE.—LOT No. 1.—This was first treated with fifteen tons of strong solution, five pounds cyanide per ton of solution, followed by three tons of weak solution, two pounds cyanide per ton. This last was allowed to stand on the ore for fifty hours, and then followed hy twenty-two tons of weak solution, put on in five-ton lots as it drained off. Then this was followed hy eight tons of wash water, put on in four-ton lots, then allowed to drain, after which vacuum was applied to take off as much moisture as possihle. The total amount of solution used per tank was forty-eight tons.

LOT No. 3.—The amount of solution used in this lot was the same as in lot No. 1; hut after thirty-five tons had heen run through the pulp was shoveled over to supply oxygen and then treated with the halance of the solution. The extraction hefore the shovelling over was 75.7%, and after the turning over and complete leaching 79.7%. The ore in this lot was considerahly haser than lot No. 1, and it is certain that the turning over was of henefit, from previous experience on this class of ore. However, the extra time and lahor halanced the extra extraction.

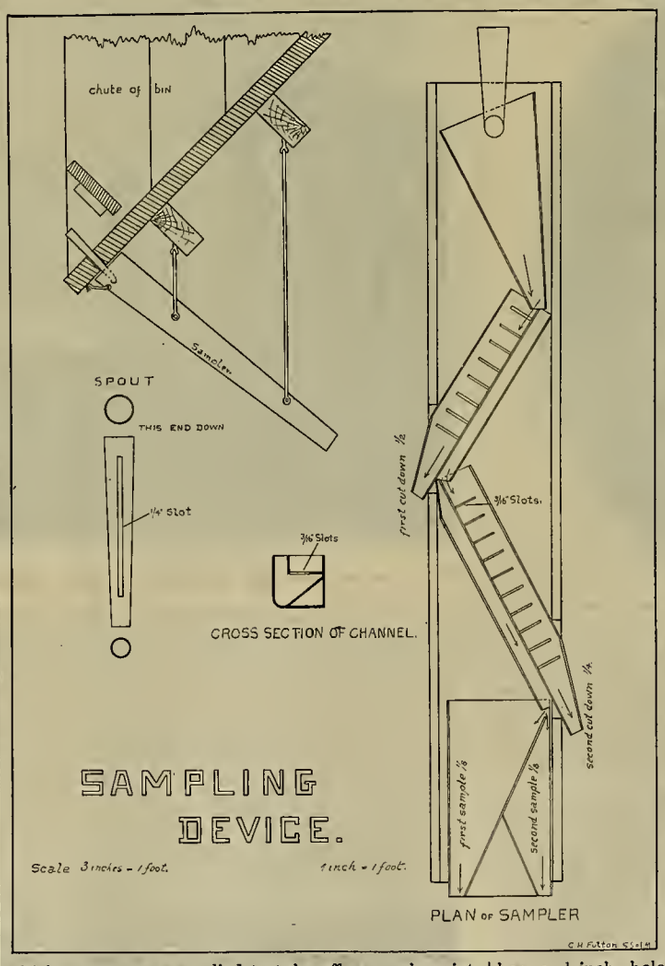
LOT No. 4.—This lot was moistened with 20% of a five-pound cyanide solution at the finished product hin. It was found that 66% to 73% of the values had gone into solution hy the time the vat was levelled off. On this lower grade of ore this method gives a somewhat hetter extraction.

Moistening with a two-pound solution was also tried, hut it was not as effective as the stronger solution. The time of exposure at the hin was also varied, twelve hours and forty-eight hours heing tried, and it was found that twelve hours accomplished as much as forty-eight hours.

LOTS No. 5 AND 6.—The treatment of these lots differed somewhat from that described under "Dust Treatment," in that all the solution used had a strength of hut two pounds per ton. Five weak solutions and one wash water were used. The slimes were allowed to settle for twelve hours, then syphoned off, 50% to 60% of the moisture heing taken out, to he replaced again hy fresh weak solution. Otherwise treatment was the same as described.

FURTHER REMARKS.—There has heen considerahle controversy in the Hills regarding the relative methods of wet and dry crushing, the wet crushing really heing a question of fine crushing. It is an indisputahle fact that in the greater part of the Potsdam ores the gold is very finely disseminated and that fine crushing is required to liherate it. Some of the ahove results would indicate that the fine material can he treated in somewhat less time, and with a higher extraction than the coarse sands, hut with somewhat more trouhle. The fine wet crushing method is coming into prominence, two mills heing in operation. It is a question whether fine crushing may not also he of advantage for those ores in which the gold is not so finely disseminated, in that hy raising the extraction and possihly decreasing the time, in spite of the more complicated plant necessary, an economy could he instituted.

METHODS OF SAMPLING ORE, TAILINGS AND SOLUTIONS.—The ore that goes through the mill is automatically sampled at the finished product hin by the following device: A tin tuhe, 10 inches long, having a longitudinal slot ¼ inch wide, projects into the discharge spout of the hin. The material which enters this tuhe is discharged on an inclined shallow trough, provided with diagonal tin troughs, perforated with narrow slits at right angles to their length. Part of the material passes through the slits and part over them, this last heing discarded. What passes through the slit is deflected to a similar tin trough again, heing halved as hefore, and what passes through is split into two equal parts hy a deflecting sheet of tin, making a final duplicate sample. (See drawing for detail and further explanation.) This device samples automatically whenever the discharge spout of the hin is opened. The device has heen checked against samples taken hy coning and quartering from the hin product, and also hy sampling the ore after it leaves the Gates crusher, taking out every tenth shovel and quartering this product down. It agrees very closely with hoth of these methods.



SAMPLING THE TAILINGS.—The tailings are sampled in the vat hy a pipe sampler, twenty samples heing taken around the outside circumference. Two assays are made on this material, one on the washed sample and one on the sample hefore washing, to determine what goes to waste hy retained solution.

SAMPLING THE SOLUTIONS.—The solutions are sampled at the head and end of the hox by means of drip samples. The elhow which turns the pipe into the hoxes has a ⅛-inch hole into which a cork fits, through which passes a bent glass tuhe, attached to which is a piece of ruhher tuhing. At the end of the tuhe is an adjustahle clamp, which regulates the drip. The drip is caught in an old acid hottle, and hy these means a very fair sample is ohtained. In thus regulating the drip hy an adjustahle clamp a hetter sample is ohtained than where no clamp is used, simply allowing the ruhher tuhe to reach to the hottom of the hottle and letting the excess overflow, as is the practice in some mills.

THE METHOD OF TREATING THE PRECIPITATES.—The precipitates are separated in the cleanup into the

* Bulletin No. 5, South Dakota School of Mines.

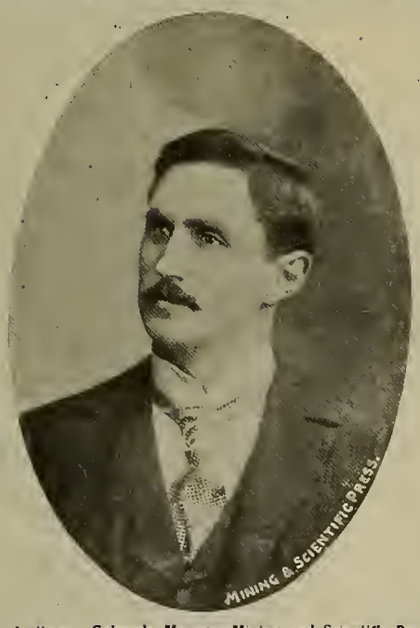
fine slimes and the coarser zinc thread which has been attacked enough to pay to treat. The fine material, after being thoroughly washed on the circular filter already mentioned, is treated with dilute sulphuric acid, one part acid to two parts water, until most of the zinc has been dissolved, then washed and dried and smelted with 75% of its weight of the following flux: Four parts of borax, two parts of soda, one part of nitre, one part of sand. While molten the fusion is thoroughly stirred with green wood, the same process known as "poling" in copper metallurgy. The product from this first melt is remelted with some borax and a little nitre to refine, a little bone ash being also added. The bullion contains very little silver and about 10% of base metal. The fine slimes represent about 90% of the value of the total precipitate. The coarser material is first dried and then roasted at a dull red heat in a covered sheet iron pan, 10 square feet area and 10 inches high, which is set on a large wood-burning stove. The roasted product is then smelted directly with the addition of the above flux. The slag bottoms from the melts are crushed and panned, the pannings melted with lead and the button cupelled. The balance of the slag is sent to the smelter.

The power for the mill is furnished by two boilers, return tubular, rated at 60 H. P., and a 55 H. P. Buckeye engine. Cost of fuel at the mill is: Sheridan coal, $4 25 per ton; mine run, $3.50 per ton; 4-foot wood, $3.60 per cord.

THE NUMBER OF MEN EMPLOYED AT THE MILL.—Day shift—One crusher man, one drier man, one roll man, one oiler, one engineer, one blacksmith, one solution man, two shovellers, one foreman, one assayer, one assayer's helper, one superintendent. Night shift—One crusher man, one drier man, one roll man, one oiler, one engineer, one solution man. Making a total of nineteen men.

Our Colorado Manager.

Herewith appears a portrait of our new Colorado manager, Mr. Edwin J. Moore of Denver, who on the 12th inst. assumed charge of the interests of this journal for the State of Colorado. Mr. Moore has a handsomely fitted-up office at 606 Mack Building, corner 16th and California streets, Denver, Colo., where he will be pleased to meet friends and patrons of the MINING AND SCIENTIFIC PRESS. He has had six years intimate business acquaintance with the mining and business interests of the commonwealth of Colorado and is well and favorably known therein.



E. J. Moore, Colorado Manager Mining and Scientific Press.

A NEW ZEALAND novel prospecting plant, in use by an amateur prospecting party in that country, is described in an exchange as follows: It consisted of a complete hydraulic elevating plant and a prospecting spoon to test the bottom of a river. The whole appliances were so designed that when they were put together they formed a wheelbarrow. The spoon was composed of an old oil drum, attached to a long handle (the detached shafts of the wheelbarrow, spliced together). On the end or mouth of the spoon was a spring trapdoor, which was let go when the spoon was supposed to be full, and the contents were thus prevented from running out. A small ripple was fixed in the bottom of the spoon to catch the gold. The hydraulic department of the plant consisted of about 40 feet of canvas hose with a nozzle attached, and some 6 feet of 6-inch elevating pipe, and the way in which it worked and the quantity of stuff it put through was somewhat surprising. Twenty minutes would transform the whole affair into a wheelbarrow again, and off the prospectors would go to the next gully.

The Otto Aerial Wire Rope Tramway.

As far back as 1644, cars or buckets were carried on ropes, the first account of such system of telpherage coming from a Dutch engineer, Adam Wybe, who in that year carried little buckets loaded with earth across the Moar river, Dantzig, Germany, by a ropeway. For two centuries after little was done, beyond some primitive construction at Klausthal, Germany; but in the last half of the nineteenth century the system developed proportional to the general advance in all scientific appliances.

The designing and construction of wire rope tramways is now a distinct and important branch of engineering, and the matter has engaged the attention of many bright men, with the result that the wire rope tramway is a foremost factor in the problem of transportation, especially where the local situation precludes the employment of other systems of carrying.

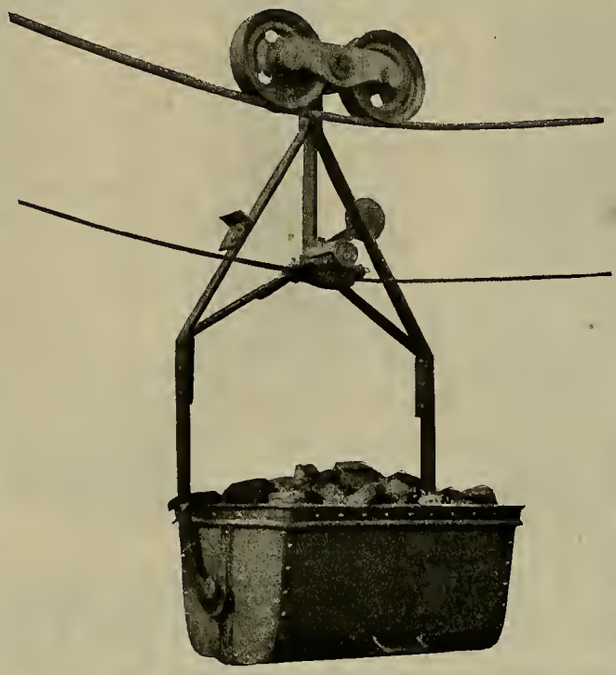


Fig. 1—The Otto Aerial Wire Rope Tramway.

In this regard the Otto aerial wire rope tramway is deemed worthy of note. In this system are two stout wire cables of special construction, the carrying cables forming two tracks on which the cars run, laid parallel in the same horizontal plane on supporting structures of wood, or iron and steel, of varying heights, and tightly stretched in a straight line between two successive stations.

On one of the carrying cables the loaded cars run in one direction, while on the other cable the cars return, usually empty. The carrying cables are anchored at one end, while at the other a tightening or tension gear is provided. The cable ends are here connected to chains or pliable ropes passing over pulleys and attached to balance weights, which are determined by the admissible stress on the cables. In this manner the carrying cables are always equally stretched, the weights rising or falling according to the sag of the cables, due to the weight of the cars and to the expansion or contraction of the cables in consequence of changes in temperature. The car forms an important part of the tramway. An

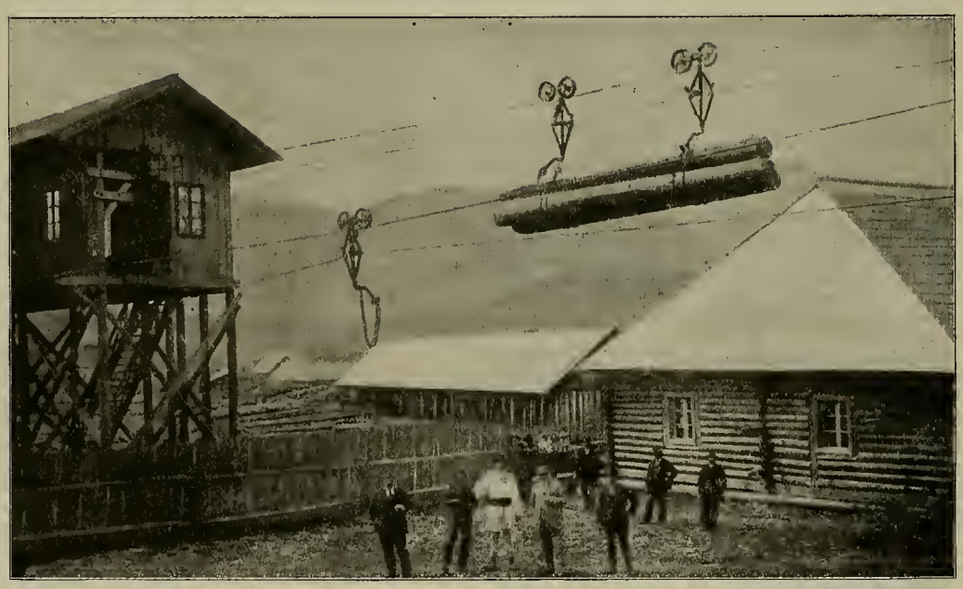


Fig. 2—Otto Aerial Wire Rope Tramway for Transport of Logs, in Cimpa, Hungary; 11¼ Miles Long; Capacity 40 Tons Per Hour.

Fig. 3—Otto Aerial Wire Rope Tramway for the Krupp Mines, in Sayn, Germany; 1558-Foot Span; Length of Line, 12,946 Feet.

ordinary car consists of the truck or carriage, the hanger, the grip and the bucket. The latter hangs perpendicularly under the carrying cable, and forms the lowest part of the car, while the truck running on the carrying cables forms the top part of the car. The hanger to which the grip is fixed connects the truck with the bucket, as illustrated in Fig. 1.

The truck or carriage consists of two grooved steel wheels, placed one behind the other, the axles of which are fixed in two steel plates. The latter are riveted to a distance piece in the middle between the wheels, so as to form one solid frame. The axles of the wheels are made of phosphor bronze and are screwed at both ends into the two steel plates mentioned above, thus forming two distance bolts. These axles are hollow and filled with a lubricant. Through suitable holes the lubricant reaches the circumference of the axles, lubrication being effected automatically.

Fig. 2 illustrates how, for the transportation of lumber, timber, tubes, iron bars, etc., two cars coupled together are employed.

Fig. 3 illustrates an Otto aerial wire rope tramway at the Krupp mines in Sayn, Germany. This tramway, built for transport of iron ore, connects the mine with a narrow gauge railway. The length of the line is 12,956 feet, with an average fall of 1.21 and a required horse power of 3.5. The tramway passes over uneven ground and the longest spans on the line vary from 646 and 1640 feet. All supports are of iron. At the loading and power station at the mine the tramway cars are loaded from bins, through ore chutes with sliding gates. The unloading station of the tramway is located at the loading track of the railway, and is so arranged that the tramway cars are dumped in bins provided with chutes and from which the railway cars are loaded. An elevator or lift is also installed for raising the coal brought by the railway, up to a bin from which the tramway cars are loaded, and the coal transported to the mine.

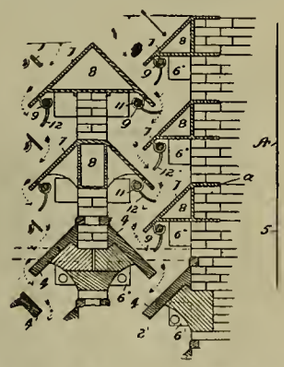
Carl Binder, engineer and contractor, 103 Randolph St., Chicago, is the sole licensee for supplying this tramway, and will furnish such detailed information concerning it as any of our readers may require.

Mining and Metallurgical Patents.

Patents Issued May 13, 1902.

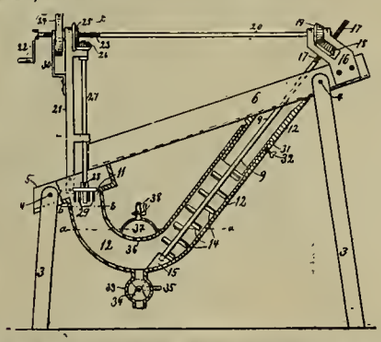
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

QUICKSILVER FURNACE.—No. 699,822; R. Scott, San Jose, Cal.



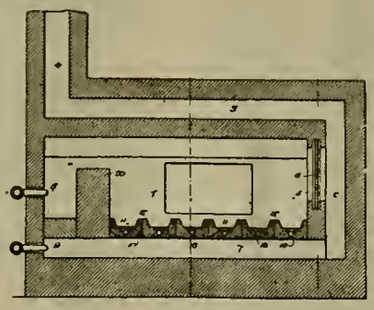
Quicksilver furnace provided with series of tiles over which the ore is adapted to pass, flue formed in one or more tiles through which gases from ore are adapted to pass, means for directing gases from ore to flue.

GOLD SEPARATOR.—No. 699,885; R. C. Lester, Mapleton, N. D.



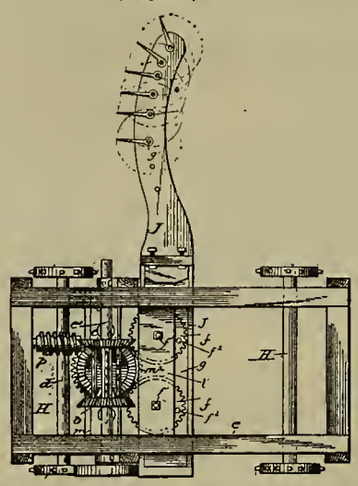
Gold separator having in combination pipe curved downward near middle, or between ends forming short and long inclined arm, vacuum chamber at upper side of curve, opening into pipe having petcock at top, chamber and curve of pipe, adapted to contain mercury; inclined stirrer shaft in long arm of pipe for driving and stirring water mixed gold holding sand through pipe, stirrer at outlet end of short arm of pipe for separating mercury and gold from sand or gravel before it leaves machine, means for connecting and driving or operating stirrers, means for providing current of water to pass through pipe.

METALLURGICAL FURNACE.—No. 699,759; J. A. Hunter, Philadelphia, Pa.



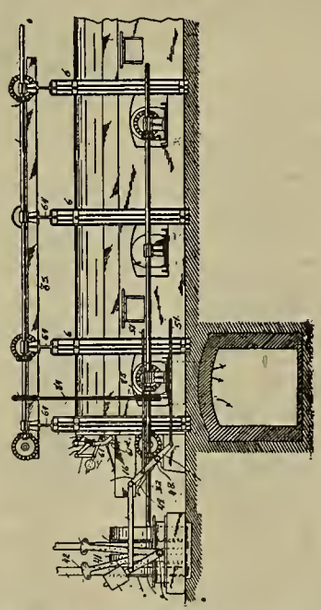
Metallurgical furnace having working chamber with bottom provided with ribs or projections for support of material to be treated, means for heating material by gaseous products of combustion introduced into working chamber, provision for introducing fluid treating agent into working chamber, independently of gaseous products of combustion.

COAL MINING MACHINE.—No. 699,864; J. Burton and W. B. Lodwick, Mystic, Iowa.



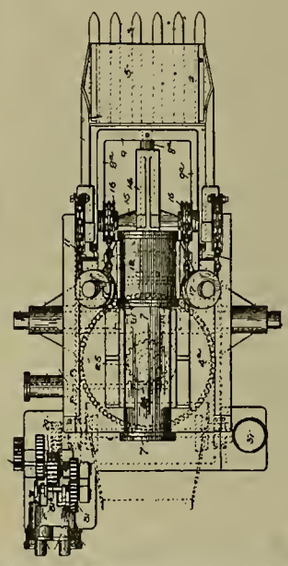
Coal mining machine, combination with frame having rotating shaft with sidewise movable beveled gear wheels arranged at suitable distances apart thereon, girths arranged one above other, slotted slide mounted on upper girth, vertical worm-shaft having upper end journaled in upper girth passing through slot slide, bevel gear on upper end of worm shaft, cog gear wheel on lower end thereof meshing with crank wheels journaled on cross bar of frame, cutter bar drive shaft, cutter bar with teeth mounted on crank pins of crank wheels, whereby longitudinal and vertical movement is imparted to cutter bar.

APPARATUS FOR ROASTING AND COOLING ORES.—No. 700,135; W. C. Davis, Denver, Colo.



Ore roasting and cooling apparatus; combination roasting chamber and hearth, of rabble carriage located in roasting chamber arranged to cause ore to travel toward rear extremity, carriage having side bars on opposite sides of hearth, propelling wheels along sides of hearth, engaging side bars of carriage, shafts outside roasting chamber extending longitudinally, geared to carriage propelling wheels, two longitudinal shafts connected in operative relation, means for transmitting motion to one shaft, cooling hearth, rabble carriage arranged to cause ore to travel from its rear extremity toward forward extremity, propelling wheels engaging carriage, shafts connected with wheels for operating, means for transmitting motion from one operating shaft to similar shaft of cooling hearth carriage, means for automatically reversing rotation of carriage operating shafts when carriages have reached limit of movement in either direction, rabble carriage of roasting chamber arranged to cause ore to travel rearwardly and discharge at predetermined intervals at rear extremity of chamber, while rabble carriage of cooling hearth is arranged to cause ore to travel forwardly, means for receiving each ore discharge from roasting chamber, automatically elevating it separately to rear extremity of cooling hearth, operation of ore receiving and elevating means being so timed with reference to travel of rabble carriages, that ore is carried upwardly and discharged on cooling hearth during forward movement of carriages, ore receiving and elevating mechanism making return movement while carriages are traveling rearwardly.

PNEUMATIC SHOVEL.—No. 699,680; L. Hanchett, Idaho Springs, and W. C. Davis, Denver, Colo.



Combination with suitable truck, of chute carried at rear thereof, arms having sliding and pivotal connection with truck, single shovel carried at forward ends of arms, means carried by truck for reciprocating arms, raising and lowering them whereby shovel is filled, raised, retracted and contents dumped into chute, operating platform at one side of truck, out of path of shovel, means on platform for controlling mechanism for operating shovel supporting arms.

INCRUSTATION PREVENTIVE.—No. 699,684; E. Holm, Chicago, Ill.

Metallic composition for preventing incrustation in steam generating appliances, consisting of zinc, tin, antimony, mercury and nitrate of silver; the zinc being present in greater proportion than that of tin, proportion of tin being greater than that of antimony, proportion of antimony greater than that of mercury, proportion of nitrate of silver being less than that of any other element.

THE island of Formosa, close to the coast of China, was for many years nominally ruled by the Chinese and practically closed to foreigners. At the close of the war with China the island was transferred to Japan, and the Japanese are taking measures to develop its resources. Formosa already contains coal mines, which are now being worked on a larger scale than ever before. Placer gold has been saved by the wild tribes of the interior. Copper and iron ores are said to exist in several places, and there are indications of petroleum. The island is beginning to be better known by foreigners, and the Japanese are quite willing to admit foreign capital.

AN artesian well in Grenelle, France, took ten years of continuous work before water was struck, at a depth of 1780 feet. At 1259 feet over 200 feet of the boring rod broke and fell into the well, and it was fifteen months before it was recovered. A flow of 900,000 gallons per day is obtained from it, the bore being 8 inches. At Passy, France, there is another artesian well 1913 feet in depth and 27½ inches diameter, which discharges an uninterrupted supply of 5,500,000 gallons per day; it cost $200,000. An artesian well at Butte-aux-Cailles, France, is 2900 feet in depth and 47 inches diameter. These are all surpassed by an artesian well in Australia, which is 5000 feet in depth.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

KETCHMAK BAY.

The Aurora G. M. Co. of Cook's Inlet are about to install a plant equivalent to thirty stamps on their property at Ketchmak Bay.

ARIZONA.

On the 19th the United States Supreme Court affirmed the decision of the Supreme Court of Arizona in the case of the United States vs. the Copper Queen M. Co. The claim grew out of the use of timber said to have been cut on the public domain by the mining company, the timber being valued at $183,000. The mining company contended that the taking of the timber was authorized by law, and the effect of the decision is to uphold that contention.

COCHISE COUNTY.

The Bunker Hill M. Co. of Tombstone will put men to work on their properties soon.

At the Cananea copper works is a slag steam generator, which consists of two boilers, one on top of the other, the two connected by a valve large enough for the slag to drop through. The slag from the smelter furnace is run through a large settler, covered to prevent the escape of heat. When desired, a valve at the top of the upper boiler is opened and the molten slag run into a slag bucket above the water in the boiler, fitting so closely that no steam escapes. Then the valve is closed and by a lever the slag bucket is inverted. The slag usually breaks into fragments about the size of gravel as soon as it strikes the water. This, however, is insured by its striking against an iron grate. The greater part of the heat is taken from it here. Then the valve at the bottom of the upper boiler is opened and the slag gravel drops into the lower boiler. By the time it reaches the bottom of the lower boiler it is cooled. Then the valve between the two boilers is closed and the water pumped from the lower boiler into the upper boiler, which is opened and the slag gravel falls into a car and is rolled away to the dump. The new generator will be 35 feet high.

The Gold Hill M. Co. has resumed work on the Eagle group of the Riggs lead. The Hilltop Silver-Lead M. Co. has run through a body of concentrating ore 100 feet from the surface. They are cutting out a station and will sink a winze. The ore body averages well.

The South Bisbee mines are reported sold for $1.000,000 to G. R. Campbell of Calumet, Mich. The holdings are near the Bisbee townsite, Arizona. There are forty-six mining claims. Reduction works may be built.

The new Copper Queen smelter at Douglas is to be controlled by a separate corporation, the Douglas Reduction Co., which has acquired forty acres. The smelter is to be 235x150 feet, the power house 200x400 feet. All these structures will have railroads within them. The machine shop and foundry will be built at once. The ore received by railroad will bo mixed in pits instead of at the furnace mouth as usual. There will be no ore bins, but instead three pits, 38x100 feet, 12 feet deep. The three pits will lie parallel, will be lined with concrete, and will have a capacity of nearly 100,000 tons of ore. In each of the pits will be a traveling steam shovel that will hoist the mixed ore into cars on trestles 18 feet above. At the smelter the ore supply tracks will be 50 feet in height, thence the main work of handling the charges will be by gravity.

The city of Bisbee has granted the Bisbee West M. Co. a water franchise, the company guaranteeing to furnish at least 75,000 gallons every twenty-four hours.

GILA COUNTY.

The Arizona-Colorado C. & G. M. Co. will develop the De Closs group of mines in Irene gulch, three miles north of Globe.

The Black Warrior C. Co.'s plant, including acid works, leacher and melting furnace are treating 100 tons daily of Montgomery ore. The development of the company's mine in Gold gulch, which is expected to furnish all the ore for acid manufacture, is under way.

GRAHAM COUNTY.

At Clifton the Shannon smelter is running successfully. Shipments of copper have begun.

MOHAVE COUNTY.

H. L. Pickett, formerly of Silver City, N. M., owns the Savanic copper mine. Eight cars of ore averaged 25% copper. The owners have been working only a small force, as there is a wagon haul of 140 miles and 300 miles of railroad transportation to land the ore at the smelters, the freight rate being $30 per ton. Mr. Pickett says there are 3000 tons of ore on the dump that will average 15% copper.

PINAL COUNTY.

At Florence the Mammoth cyanide plant has suspended operations, having treated all the tailings on hand. The work of sluicing the old tailings for the recovery of the wolframite will continue The value is molybdic acid. Wolframite is composed of molybdic acid and lead, usually in the proportion of 40% of the acid to 60% of lead.

YAVAPAI COUNTY.

C. L. Barker, general manager Monarch G. & C. M. Co., Jerome, will sink a double-compartment working shaft 500 feet.

A strike is reported in the Cypress mine, Big Bug. The ore is sugar quartz, impregnated with native and black sulphide of copper.

L. W. Felt, general manager Model M. Co., and J. McGinn, assistant general manager, report that the mine will be reopened. The property has been closed down on account of litigation. It is developed by a shaft 300 feet deep and has drifts extending 100 feet each way. It is stated that the ore body is 4 feet wide and that the ore ranges in value from $150 to $200 per ton gold. L. W. Felt is now Supt. at the McCabe.

Supt. Harrington Blauvelt has forty-five men at the Cash mine and mill. He has five men at work at the Monte Cristo camp on Groom creek and is sinking below the 200-foot level.

The Verde S., Dev. & Ore Pur. Co. has succeeded the Grand Prize Co., operating in Tonto Basin. There is a 90-ton smelter on the Grand Prize group.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence.)—At the Keystone the new 300 H. P. compressor driven by 300 H. P. electric motor has been started and is running very satisfactorily. The company is operating their hoist by compressed air and has recently installed eight machine drills. The mine is now well equipped with air driven machinery. All ore and water will be handled by compressed air and considerable reduction in operating expenses will be effected. C. E. Bunker is Supt.

Amador City, May 17.

(Special Correspondence) —At the Mitchell mine R. L. Chase, M. E., has the mortar blocks ready and the timbers framed for the 20-stamp mill, which will be running July 10. Water will be the motive power, and the Gates crusher, mill and concentrators will each have a separate wheel.

The tunnel at the Horn mine, near Defender, is now in 200 feet and in 100 feet more it is expected to tap the ledge 100 feet below water level. The ledge is small and high grade and has to be shipped to Selby's for treatment. Some samples assayed by Supt. Thomas of the Gwin mine went $503.

Drifting along the vein is still continued by the Edinburgh Gold Mining Co. An upraise has been commenced to connect with the perpendicular shaft. The ore shoot is now exposed 200 feet with every indication of continuing.

At the Tuscano mine the Amador Phœnix Co. is driving levels at the 100 and making preparation to stope. The management has under consideration the advisability of sinking the shaft 200 feet farther.

Wieland, May 20.

A strike has been made in the Wildman mine at Sutter Creek, at the 1350-foot level.

A quantity of rich quartz is reported in the Central Eureka mine, on Sutter hill.

At the Gwin mine some high-grade rock has been struck at the 1750-foot level.

The Oneida mine has installed a new pump. Sinking will be resumed. The mine is down 2100 feet vertical.

At the South Spring Hill mine, the management will open up the mine, erect a larger hoist and install new machinery. The old mill will he replaced by a new one. This mine adjoins the Keystone on the south.

The Bay State mine, north of Plymouth, is now employing twenty men; the 10-stamp mill is at work. Sinking at the 800-foot level will begin.

Good ore is reported found in the 800 level of the Bunker Hill mine at Amador City. Electric power is to be installed at this mine with a compressor, which will run the hoisting engines and pumps.

The Richards ranch, near Sutter Creek, has been bonded to the Nixon P. M. Co. L. Nixon of Jackson is Supt.

C. D. Lane has begun primary work on the Ballard & Martin claim, 4 miles north of Plymouth, in charge of W. I. Smart of Placerville.

BUTTE COUNTY.

The Dutch Ravine gold mine has incorporated, with P. P. Austin, W. R. Pond, C. M. Armistead, L. Niateo and W. F. Gates. The mine is southwest of Hurleton and was formerly worked by H. Clowe. The development consists of a double compartment shaft, 150 feet deep, with a drift running 350 feet southwest and 600 feet northeast.

CALAVERAS COUNTY.

Manager Cortmarsh of the Fanny Marie mine at Glencoe says a shoot of ore is struck in the 300-foot level. The ore body in the upraise from the 300 to the 200-foot level looks well.

The first payment on the bond of the Sargent mine at Middle Bar has been made and the deed placed in escrow. W. R. Thomas of the Central Eureka is Supt., and work has begun.

The Reliance mine, near West Point, will be started up this week.

The Golden Gate M. & M. Co. will put an engine and hoist on their mine near Bear mountain.

EL DORADO COUNTY.

The Mount Pleasant M. Co. is incorporated; directors, J. Levaggi, A. Brown, M. P. Morgan, J. J. Davis and F. J. Solinsky; headquarters, San Andreas. The Mount Pleasant mine is near Grizzly Flat, has been worked a depth of 925 feet and has drifts and crosscuts every hundred feet, which cut through ore. The mill has been rebuilt. The mine is under the management of F. G. Jackson. Twenty-five men are at present employed.

The Lucania M. Co., working a placer mine at Sportsman's hall, near Placerville, has installed 4000 feet of 15-inch pipe. M. Hughes is Supt.

T. Clark let the extension of the Big tunnel of the River Hill mine at Placerville—a distance of 1700 feet—to F. E. Huber. The tunnel is to be 7 feet high, 6 feet wide at the bottom and 4 feet 6 inches wide at the top with a side drain 8 inches deep.

W. I. Smart will work the Crown Point mine, east of Diamond Springs. The mine will be unwatered.

A. Harpending will work the Union mine this season.

The California Slate Co., operating near Placerville, shipped a carload of slate recently.

G. Hofmeister has sold the Laukamp property to Meyers & Perry for $200.

KERN COUNTY.

The Inyo G. Co. is incorporated. The company owns seven claims 8 miles from Ballarat.

The Barstow mill is shut down for repairs.

Three teams are now hauling ore from Bagdad mines to railroad. One hundred tons per day of ore rich enough to justify the wagon haul are being taken out and piled awaiting the completion of the railroad. Work on the Bagdad mines is confined to developing, this being entirely in ore; the forty-seven men now employed daily take out 125 tons.

Connections have been made in the Val Verde mine, Johannesburg.

MARIPOSA COUNTY.

A prospect has been opened up near Bear valley by Oyler Bros. and L. B. Chenoweth. A sample crushing of fifty-nine tons from the mine yielded $20 per ton, the rock being sorted.

In the claim owned by Barnard Kane and John Smither on Mt. Buckingham, they have finished a tunnel to tap the ore. The vein was struck 90 feet below the surface, average width 36 feet. The walls are slate. The ore is said to run $4.50 to $7.50 per ton.

MONO COUNTY.

R. T. Pierce, superintendent of Crystal Lake Co. of Lundy, will ship to the smelting company about 500 tons of concentrates.

PLACER COUNTY.

The owners of the Eclipse mine at Ophir will develop the property by sinking the main shaft several hundred feet deeper and drift each way on the lode. The new hoist has been started with water.

At the Eureka slate quarry a tunnel 500 feet long will be run, to be used for drainage purposes. The Eureka Slate Co. has shipped thirteen carloads of slate since Jan. 1st. Each car contains about eighty squares; at $10 per square there is money in it.

Fifteen men are employed on the Baltimore mine near Forest Hill.

At the Sailor gravel mine at Canada Hill the main tunnel is in 460 feet. Pumping machinery will be put in and breasting carried on while lower tunnel is being run.

The Bob Lewis No. 2 gravel mine at Damascus is being developed hy an Eastern company, G. Knutzen, manager; H. M. Jarvis, Supt.; purchase price $20 000, to be paid next August. The main tunnel is in 1300 feet.

The Eclipse mine, 2½ miles from Auburn, owned by F. D. Hussey, is in operation with three eight-hour shifts. The shaft has been retimbered from the surface. Hoisting works have been constructed with new machinery run by water power, a pipe line laid up the hill from the works 2200 feet.

SACRAMENTO COUNTY.

The new dredger at Teat's Flat, near Folsom, resumed operations May 16th. The capacity is about three times that of the one now operating at Mississippi Bar, there being a string of thirty-five buckets each with a capacity of 5 cubic feet. The size of the hull of the boat is 86x30 feet. Electric power will be used to operate the machinery, there being six motors, consuming a current of 200 H. P. Three shifts of three men are required to operate the boat. Fifteen men in all will be given employment.

SAN BERNARDINO COUNTY.

(Special Correspondence).—The Grand Central group of mines is located 50 miles down the Colorado river from Needles, 37 miles below Mellen, the nearest railroad station, 12 miles from the county wagon road at West Wells, and near the old Rincon steamboat landing. The formation of the district is chiefly granite and porphyry. The group consists of six claims. The northeast end of this mine is only a few feet from the banks of the Colorado river. Three tunnels are in 80, 40 and 30 feet, respectively. The ore is free milling, the value gold. All of the claims are much higher than the surrounding valleys and ravines, and slope toward the river. On the Grand Central group the veins are regular, well defined and average from 3 to 6 feet in width. The millsite is on the river bank adjoining the mines, and only 300 feet of pipe would be required to bring in a water supply. Mesquite and iron wood fuel cost from $2 to $2 50 a cord. The claims are owned by Gilroy, King & McGraw, the latter being Supt.

Yuma, Ariz , May 16.

SAN DIEGO COUNTY.

The Noble gold mines, near Julian, are under option to J. H. Thring for $30,000.

SAN FRANCISCO COUNTY.

The Standard Oil Co. has bought the Arctic Oil Co.'s works, including their plants, docks, facilities, tank lines, tank cars, wagons, and the various offices. The Arctic Co. will probably go out of business. This transfer will be a blow to the independent oil companies, both in the East and on the Pacific coast, being at the mercy of the Standard oil trust in the matter of illuminating oils.

SAN LUIS OBISPO COUNTY.

Los Burros district, in the extreme northern part of San Luis Obispo county and the southern part of Monterey county, report activity. Nuggets ranging in value from 50 cents to $1200 are reported found in the loose soil.

The Ralston people are taking out coarse gold on Spruce creek, and gold has been found on the south fork of Willow creek.

The New York mine will soon have a mill up and running on rich ore. H. C. Dodge has bonded the Grizzly property to W. D. Murray and C. W. Burge, who have incorporated as the Mother Lode M. & M. Co.

The tin pipe plant on the claim of the Madrone Quicksilver Co., in the Josephine district, is in process of installation. The furnace will be ready to fire this week. A Los Angeles report says the crude extraction on a small scale yielded 50% of quicksilver.

SISKIYOU COUNTY.

In the Yellow Butte mines, owned by H. J. Sarter and associates, 12 miles east of Edgewood, copper in the ore assays as high as 30%, with $4 to $6 in gold. A small streak of ore on the foot wall carries a little platinum. A shipment of a carload of this ore to the smelter proved satisfactory; but, owing to the low price of copper, the owners will continue development work and store the ore extracted. The cost of transportation is great, as the ore has to be hauled 12 miles to Edgewood, the nearest railroad station.

Bjork & Silva have run a tunnel 400 feet in the mountain north of Hawkinsville to strike their ledge lower down.

C. N. Gordon is prospecting a quartz ledge at Hawkinsville.

Wyke & Davidson have recently discovered rich quartz mines at Salmon river, near Etna.

STANISLAUS COUNTY.

T. Donohue, foreman of the dredging company at La Grange, has started a second steam prospecting drill. The company has secured nearly 4000 acres of river bed, lowlands and hydraulic land for dredging purposes.

TUOLUMNE COUNTY.

The Confidence G. M. & M. Co. at Confidence will put in a new 100-ton cyanide plant.

Gold dredging operations at La Grange are being conducted by Col. Doolittle, Alex. Brown and Maj. Wiltsee. They are

operating a steam drill. The company has bonded 1400 acres of gravel land, 17½ miles of ditch carrying 5000 inches of water. An electric power plant will be built at La Grange.

W. H. Beynon of Rawhide has sold to C. W. Knox of Columbia the F. B. Gandy and Blue Bucket quartz mines, north of Rawhide.

The Yankee Hill M. Co. has bonded a claim at the head of Experimental gulch.

C. P. Hall has struck pay ore on a claim he has located on Moccasin creek, near Big Oak Flat. Some of the rock is good enough to pound up by hand.

J. McCready has made a strike on his claim, from which up to date his returns amount to $1200.

The Cosmopolite, Two Brothers and Longfellow mines have already got started up on a small scale, and it is reported that the Nonpareil Co. is to do extensive development work.

COLORADO.

ARCHULETA COUNTY.

The Omaha M. Co., Pagosa Springs, W. R. Black manager, have ordered hoisting and mining machinery.

BOULDER COUNTY.

Of the Melvina mine at Wallstreet the Miner says it holds first place in having produced from the first assessment shaft $20,000, in sinking a distance of only 20 feet.

The Orphan Boy at Copper Rock is to be equipped with machine drills. Work will begin on the tunnel as soon as the machinery is installed.

CHAFFEE COUNTY.

On July 1, the Monarch mine of Leadville, owned by the Ohio & Colorado Smelting Co., which is building a smelter at Salida, expects to begin shipping 300 tons of ore a day. The manager is T. Goodwin. The company has already expended and contracted for $200,000 worth of material. Arrangements are made for storage ore bins so that 500,000 tons of ore can be carried as a surplus. The three boilers are 200 H. P. each. An apartment 40x120 feet will contain the four lead furnaces, capacity 150 tons each. The matte furnace room is 40x60 feet and will contain a matte furnace 250 tons capacity and also a combination furnace for handling the lead matte. The flue chamber will be 675 feet long. The stack is 30 feet at the base and 150 feet high.

In the Orient mine, operated by the Colorado Fuel & Iron Co., large bodies of excellent grade iron ore have been opened.

CLEAR CREEK COUNTY.

Consolidation of the Hidden Treasure group at Empire and the Edinburgh group on Republican mountain, near Georgetown, under the title of the Hidden Treasure M. Co., combines properties superintended by J. F. Standish, who has shipped 117-ounce silver ore from a drift on the Edinburgh.

C. L. Burt has bought the Vulcan group above Silver Plume. Work goes on under the direction of Supt. Decker.

A new vein on the property of the Omar G. M. Co., Idaho Springs, has been opened in the tunnel 400 feet in, which yields 18 inches of $20 ore.

Regular shipments are being made from the Fraction mine of the Occidental Dev. Co., of which W. Redding is manager.

Lessees on the Aliunde mine have received returns on seven tons at $235 per ton, and on twenty-four tons at $85 per ton.

The I. S. M. & R. mill has its 30-stamp amalgamating section complete, and running constantly. The company have a lease and bond on the Modoc group.

The Burns Moore tunnel is working two drill shifts, and breaking down 8 feet a day. The tunnel is in 630 feet.

DELTA COUNTY.

A gold discovery is reported in the Crystal Creek region, 30 miles south of Hotchkiss, on the north side of the Black mesa. The formation is a brownish quartz interspersed with yellow talc. The Black mesa is a high, wide strip of mountain country lying between the North Fork valley and the Black canyon below Gunnison, and is practically a continuation of the Elk mountains extending west to the Black canyon of the Gunnison. The nearest and most practicable route to Crystal creek is by way of Hotchkiss. One hundred claims have already been staked.

DOLORES COUNTY.

The Mt. Goram M. & M. Co.'s mill at Dunton, is running on ore principally from the Altmont vein, although much of it is being taken from the Smuggler vein.

CUSTER COUNTY.

A strike is reported in the Hector mine at Querida. Jennings Bros. have opened a body of ore 200 feet by 70, which will yield one ounce free milling ore to the ton. The property is bonded to C. H. Haskell of Silver Cliff for $250,000.

The Custer City M. & R. Co. of Pueblo and Custer City is working men on the Whistle property adjoining the Bassick.

EL PASO COUNTY.

The new Portland mill at Colorado City will not be completed before June 15, on account of delay in receiving machinery and steel contractors behind on their contracts.

GILPIN COUNTY.

For the first week of May the shipments of smelting and crude ore, concentrates and tailings from the Black Hawk depot to the smelters and outside points of treatment were 121 cars of 2240 tons.

The Swamp Angel mine, in Eureka district, is being operated again after a long idleness.

The Bertha M. Co is sinking its Colfax shaft at the head of Elkhorn gulch.

Work upon the new miners' sampler in Central City has begun in charge of E. L. Olden.

Operations on the Terrible group are continued. Ten tons were shipped by leasers, which yielded 104 ounces silver, .09 ounce gold and 48% lead, a money value of $70 per ton.

Shipments from the Kansas-Burroughs mines, on Quartz hill, for March were 3321 tons. Half this tonnage went to Denver and Golden smelters; the remainder was milling ore.

GUNNISON COUNTY.

McConaghy & Cunningham, of Victor, propose soon building a new concentrating plant, fifty tons capacity, to treat the milling ore in the Hathaway property on the Cochetopa. The Sterling tunnel is in 975 feet, and shows ore the entire distance. About 4000 tons of ore is on the dump, having been taken out in development. The Colorado Mines Consolidated Co. is operating property in the Cripple Creek, Robinson and Bonanza districts, besides the Cochetopa.

HINSDALE COUNTY.

At Lake City, Supt. Carr of the Moro and Ajax tramway and mill is putting the machinery in place and by July 1 wheels will be turning and shipments begun.

In the Ute mine the body of ore cut when the tunnel intersected the vein at a distance of 1500 feet about a year ago shows no signs of giving out. Supt. Nicholson recently ran a crosscut from the main tunnel to the vein at a point about 500 feet back of where the vein was cut a year ago, the result being the tapping of a body of ore 2 feet wide, assaying, besides gold and silver, 45% lead.

Supt. Wearne tells the Times that at the Bonanza tunnel and upraise of the Henson Creek Lead Mines Co. the raise is up 135 feet and the tunnel 800 feet from mouth to breast.

Men are employed at the Hidden Treasure, and all departments—mine, tunnel, tramway and mill—are running.

Manager D. A. Farrell of the Red Rover Co., operating on Henson creek, will put in an aerial tramway from the mine to the mill, 2 miles. A 100-ton mill is under way. The ore has a lead base and carries gold, copper and silver. The concentrates are worth $65 a ton; there is a gray copper ore in the crude worth $100 to the ton. The entire plant will be operated by electricity. The output averages nine carloads a week. In the Burrows Park district the ore is a sylvanite.

JEFFERSON COUNTY.

(Special Correspondence.)—Dr. Carpenter, manager Golden smelter, states they are getting more ore than they can handle with their present facilities, and they are figuring on enlarging the plant, but no definite conclusion has been reached.

Golden, May 18.

LAKE COUNTY.

The best grade of iron ore now being mined in the Leadville basin is found in the Bohn at about 500 feet. This will run from twenty-five to forty ounces silver, and is classed by the smelter as ore.

At the El Paso on Fryer hill seventy men are employed in installation of new plant. Manager Newell will have it running July 1.

OURAY COUNTY.

In the San Juan district a strike is reported in the Morning Star, in Sneffels district. The tunnel has been driven 400 feet into Stony Mt. The ore is 16 inches wide in the breast and widening. In the Revenue, which has been a silver mine, the silver seems to be giving way to gold, as the recent strike of eight ounces gold per ton would indicate. The new power plant will be ready and current turned on by June 1, when the force of men in mine and mill will be increased.

The output from Sneffels district will be larger than in any year in its history. The Altoona, Humboldt, Governor and Pilot are working large forces.

In the Red Mountain district Eastern capitalists have been making investments, and the old producers are being overhauled and placed on the shipping list. The Genessee, Vanderbilt, Congress, St. Paul, Guston, National Belle, Saratoga and a number of other old-time paying properties are being put in working order. A tunnel 2 miles in length will be constructed to drain the lower workings of the Guston and Yankee Girl. The Treasury tunnel is working a large force and is in 2000 feet. The Swamp Angel group, which is owned by Pennsylvanians, will continue operations all summer. The company has twenty claims patented and a tunnel has been constructed to connect with the Silverton Railroad.

The contemplated pyritic smelter in Ironton is said to be an assured fact; a portion of the purchase price was recently paid. This will afford the owners of low-grade propositions an outlet for the treatment of their products Upon the completion of the smelters, the Silverton Railroad will be placed in running order from Red Mountain to Ironton.

SAN JUAN COUNTY.

The Mogul mine above Gladstone has recently put on forty more men. A strike of milling ore has encouraged the company to begin work on the mill.

Ten men are at work on the Irene. The tunnel is in 500 feet, and a strike of gray copper and iron ore was recently made. Shipments of lumber, material and supplies are going up almost daily.

Preparatory work on the new mill for the Silver Ledge at Chattanooga has begun. The mill will have 200 tons capacity. The size of building 120x120 feet, 60 feet high. Ore will be delivered to mill by tramway from mine 3000 feet long, capacity 200 tons per ten hours. There will be a 10x20 crusher, two 6-foot mills, twenty concentrators; water power will be used; 7000 feet of 12-inch pipe will furnish water under 890-feet head. A large reservoir will be built. W. Feigel is in charge of construction.

The Aztec G. & C. M. Co. have seven men running the tunnel on their mine in Needle Mt. district. Several good ore shoots have been cut.——At the Hercules, on Sultan Mt., two steam drills are working, preliminary to starting the mine and mill under full headway.——A sample test across the 4-foot vein recently opened in the North Star at Silverton give $50 per ton.

SAN MIGUEL COUNTY.

The following is a statement of mill returns from the Tomboy mine and mill July 1, 1901, to March 31, 1902:

Month. 1901.	Tons Crushed.	Yield.	Expenses.	Profit.
July	6,100	$ 92,200	$38,500	$53,700
August	6,600	111,350	43,400	67,950
Sept.	6,212	70,523	40,968	29,555
October	6.972	57,456	43,860	13,596
November.	7,061	73,334	37,908	35,426
December.	7,664	78,500	42,500	36,000
1902.				
January	8,544	87,080	43,666	43,414
February.	7,200	65,100	41,000	24,200
March	7,900	60,250	43,500	16,750
Total	64,253	$695,793	$375,302	$320,491

The average value of the ore was $10.83 a ton, the expense averaged $5.84 a ton and the net profit was $4.99 a ton.

Superintendent Sayer of the Butterfly-Terrible M. & M. Co. says: "In January we closed the mill down, as we felt we could not run during the winter months on low-grade ore at a profit. We have confined our efforts in extending our lower tunnel. We have installed a compresser and power drills at the mouth of No. 3 tunnel. During the past year and up to the time of closing our mill we mined and milled 11,467 tons of ore. The operating expense of the mill was 56 cents per ton of ore, and the total cost of mining, including supplies, as well as for tramming, crushing and blacksmithing supplies, was $3.92 per ton, making a total expense of $4.48 for each ton of ore produced. This expense does not include development expenses, nor do the improvements on the surface plants nor new equipment enter into the cost as here given."

On the 7th inst. the Liberty Bell will resume work.

Treais and Lundstrom have begun work on their contract to drive the deep crosscut in the Japan vein, near Telluride. When completed the tunnel will have a total length of 2700 feet, and will cut the vein 300 feet below the present deepest workings. It is estimated that a year will be consumed in driving this tunnel.

SUMMIT COUNTY.

Parsons & Connors will develop the Wild Irishman group at Montezuma by a 3000-foot tunnel. There is on the group a vein 11 feet wide, from which a siliceous ore carrying 40% to 50% lead has been mined. The Wild Irishman ore, it is stated, runs ninety-two ounces silver and 30% lead. Production of the entire camp of Montezuma is estimated at seventy-five tons daily.

TELLER COUNTY.

At the Elkton the work of cutting the 900-foot station will be finished June 1, when sinking to the 1000-foot level will be resumed, and a small hoisting engine will be placed in the 900-foot station. The rock will be hoisted to the 900-foot level and thence handled to surface. The first of the two pumps ordered will arrive in July, and then the 1000-foot station will be cut large enough to permit installation.

There are five sets of lessees working on the Pharmacist claim of the same company on Bull hill; four are making regular shipments. The ore averages two ounces. Royalties for April amounted to $1075.

Kirk & Co., operating a lease on the Clara D., on Bull hill, have installed a 10 H. P. steam plant and hoist.

The Plymouth Rock, owned by W. D. Stratton, is down 500 feet. It is his intention to sink 2000 feet. No lateral work will be attempted until the shaft has reached the 1000-foot level.

The Empire State, better known as the Orphan Belle, on Bull hill, is now in charge of G. Kilborn, formerly Supt. Isabella. The three-compartment shaft is down 900 feet. In the three lower levels there is ore. No stoping has been done. The ore is being taken out from all of the lower levels and shipments of sixty tons are weekly made.

Shipments are maintained from the Battle Mountain Con. Co.'s property, where a new strike is reported in the lower trail tunnel.

A new steam plant will be installed on the Mountain Beauty claim, now under lease to Hunter, Cartwright & Co. At a depth of 100 feet they have a vein over 3 feet wide from which mill tests gave returns of $25 and better.

C. M. Thayer, president Bedford G. M. Co., projects making the new 50-ton concentrating plant which his company is planning to build at the property in Cripple Creek a 100-ton concern, as double the capacity can be installed at a small increased outlay over the initial expense. He will also install four non-hydraulic concentrators. This mill is being put up by Boston capital. It is the first serious attempt to handle the low-grade ores of Cripple Creek made since the stamp mills of early days.

The Ben Hur Co. made its first shipment May 14. The ore is broken from a depth of 600 feet, north of the shaft, from what is believed to be the extension of the Midget ore shoot.

The Hildebrand Co., on Grouse mountain, is doing extensive development work, extending the 400-foot level, on a strong vein, 5 feet in width. It is the intention to continue drifting for the contact with the phonolite dike.

A trial shipment from the Elkton dump has been closed by E. C. Rickard, who recently leased the dump, which contains 150,000 tons. Case & Williams, lessors on the Morning Glory claim of the Work, have started a new shaft on their recent find. They have a 16-inch streak of ore that averages three ounces of gold to the ton, and they have shipped 27 tons of ore from the excavations.

Cripple Creek reports some possibility of resumption of work on the Moffat tunnel of the Gold Exploration and Tunnel Co. by reincorporation as a railroad company, which will permit of passage through property now denied to them. The tunnel starts on the west side of Gold hill, near Cripple Creek, and is to end on the northeast slope of Bull hill at the Victor mine, about 3 miles. Half the distance has been covered. At the latter point the depth will be 1600 feet, and at one point beneath Bull hill it will be 1800 feet below the surface, which is 100 feet deeper than any shaft in the district has penetrated. It is in this locality that boring has been interrupted. There is a strip of ground 18 feet wide which the company has been refused the privilege of crossing.

The United Gold Mines Co. is the title of the new consolidation of the Woods Investment Co. It will take over the assets of eight Cripple Creek companies, absorbed into a capitalization of $5,000,000. The allotment of shares is as follows: Consolidated Gold Mines, 1,908,000; New Zealand Consolidated, 920,000; Damon Victor, 200,000; Battle Mountain Consolidated, 485,160; Columbine-Victor, 200,000; Columbine Gold, 29,709; Bonanza Queen, 25,000; United Mines Transportation, 22,500; total, 3,994,769.

In the Golden Cycle mine ore is found on 1000-foot level averaging $25 to $30. The vein is 5 feet wide and the pay shoot has been developed 30 feet.

The lessee of the Gold Bond mine, Cripple Creek, has received returns on eighteen tons of ore at $63.40 per ton.

From the Burns claim of the Acacia Co. twenty-two tons gave returns of $55 per ton. A vein has been opened on this property 4 feet wide.

A strike is reported on the sixth level of the El Paso mine on Beacon hill. The ore carries much sylvanite and calaverite.

Superintendent Bainbridge reports the vein 5 feet wide; 12 inches will ship $600 per ton and 24 inches $300 per ton. The vein at the tunnel level has yielded several carloads running as high as $378 per ton; the general average of the shipments has been $50 per ton. The earnings for April were $9000 above all operating, development and improvement expenses. Surface plant, hoilers and shaft have heen paid for and $30,000 is in the treasury.

IDAHO.

BINGHAM COUNTY.

At Blackfoot, miners of the White Knob M. Co. have declared off the strike. The company has granted recognition of the union, and has consented to employ none but union miners. Over 100 men were out, and the mine was tied up.

IDAHO COUNTY.

At Hump, Manager Stevens of the Cracker Jack has machinery for the 5-stamp mill and says he will have the mill running hy June 1st.

Fourteen claims In the Thunder Mountain district, west of Monumental creek, have been sold to Pittsburg people, price $20,000, of which $2000 is paid and $5000 to be paid in thirty days.

The Thunder Mountain Industrial Co. at Thunder mountain has bought the Anaconda group of eight claims for $10,000.

The Belle of Thunder Mountain Co. has bought the Holcomh group of sixteen claims for $200,000.

The bonded claims held by Boise parties on the Apex, Black Jack and Holy Terror has been sold for $40,000.

OWYHEE COUNTY.

In the Addie group, 165 feet from the surface, the ledge has widened out, and the body of ore will mill $15 per ton in gold. The mill grade is completed. Millwright C. E. Knapp has charge of the erection of the plant. The mill will be completed and in operation in July.

The Avalanche hears that the Poorman mill will be in operation this year.

MICHIGAN.

HOUGHTON COUNTY.

At the Calumet & Hecla electric pumps are being installed in No 7 shaft of the Hecla hranch.——The Old Colony C. Co. has broken ground for their new shaft on the lode recently located hy diamond drill.

The new timber cars made hy the Calumet & Hecla M. Co. for No 2 shaft, Calumet, are in service Each car holds thirty-six pieces of timber, instead of the nine which were all that could he lowered under the old arrangement. Each is also so built that it is loaded at the timber piles on the surface and then drawn to the shaft and lowered, while the use of two permits one to he at the timber piles loading while the other is being unloaded down in the mine. The use of these cars facilitates the lowering of timber into the mine; more time will he given for hoisting rock and the daily output of the shaft will be increased.

The report that the Calumet & Hecla will at once resume work on the amygdaloid shafts of the property is denied at the mine.

MISSOURI.

JASPER COUNTY.

Local zinc companies are asked to pool their stock in a combination of leading producing and smelting companies, the Southwestern Ore Purchasing Co. to handle all the ore produced in the Joplin district and maintain a staple price for the metal. Contracts have already been agreed upon hetween a percentage of the producers and the syndicate, whereby the former agree to sell their entire output to the syndicate at a uniform price; similar contracts to he obtained from the smelters whereby they agree to purchase exclusively of the corporation to he formed at a uniform price which shall be $1.50 more than is paid to the producer.

MONTANA.

BEAVERHEAD COUNTY.

Operations at the Golden Era mine, above Argenta, have been discontinued; the machinery will he moved to the Little Whale mine.

In the old Seligman claim, near Argenta, is reported a find of tellurium ore going $2000 to the ton.

DALY COUNTY.

Coal has been discovered north of Anaconda. The development of the mine has been a tunnel 160 feet long. A shaft has been sunk. The coal is said to be a deep black color, and hurns readily.

FERGUS COUNTY.

The North Moccasin Co. is pushing development work on the Possible claim, under the direction of Supt. C. Ridell. A new mill will he put in this season.

FLATHEAD COUNTY.

Cabinet Is 45 miles east of Libby. One year of actual mining has warranted the placing of seven stamp mills within a radius of 6 miles of Cahinet. The Brick & Brannigan 10 stamp mill has run all winter. The Mother Lode and West Kootenai mills, 10 stamps each, are ready to run; the Binkstown mill is running. Machinery for the Black Tail, Fourth of July and the North Fourth of July mills is at Cahinet and is being placed in position. A mill is going up north of town. The Boardman-Hitts claims have ore on the dump that runs $40 to $75 per ton.

JEFFERSON COUNTY.

On the Pearl H the tunnel was driven on a large body of copper ore for 250 feet. Three veins of higher grade ore were cut. J. Johnston of Bernice is general manager.

LEWIS AND CLARKE COUNTY.

The report of the Montana Co. for the half year to December 31st shows that profits are still heing made by treating the ore remaining in the Drumlummon mine. In all 12,000 tons of ore were treated in the stamps and 64,000 tons of tailings cyanided. The former did not yield any profit on working, hut the latter fully compensated, so that a net profit of $55,000 was made. The new properties acquired by the company—the Lucky Girl group in Nevada—have heen equipped with machinery and work started. The concentrating system in vogue at the Drumlummon is not suited to the ore at the Lucky Girl; a cyanide plant is to be substituted.

MISSOULA COUNTY.

Interest is manifested In the recent discovery of gold along the bed of Vermillion creek, one of tbe tributaries of Clark's Fork of the Columbia river, 35 miles from Cedar creek, a section from which much gold was taken in the early days of placer mining in Montana. All of the ground along the bed of Vermillion creek has been located within the past two years. The claims have heen worked In a small way by the old method during the summer season, but always with good results. Several large companies have been trying recently to get control of sufficient ground to justify puttlng in a dredger.

The Vermillion Placer M. Co. has eight claims which it intends to work by hydraulic system. The company can run a tunnel through a ridge lying at the lower end of tbese claims, a distance of ahout 220 feet, for $10,000; it will then he ahle to work the ground ahove, 120 acres, with an average depth of 35 feet to bedrock, at a cost of 3 cents per cuhic yard. Prospecting shows that the ground contains gold, which is distrihuted through the gravelly soil lying ahove bedrock.

SILVER BOW COUNTY.

The Butte Copper M. Co. has a lease and bond on the Amazon claim, amount $75.000, due May 1, 1903—first payment $7500 in ninety days, other payments $22,500 each succeeding three months.

NEVADA.

ESMERALDA COUNTY.

In the Nevada Chief, near Pine Grove, there are 2 feet of ore in the drift, 10 inches of which is reported high grade. The office of the company is in Los Angeles, Cal. It is the stated Intention to huild a stamp mill on the property.

The new strike at Lone mountain, 14 miles from Silver Peak, 30 miles from Tonopah and 35 miles from Candelaria, is spoken of as a substantial ledge 30 feet wide and 100 feet long, assaying about equally in silver and gold, with an admixture of galena. The water supply is 7 miles distant. Several leasers are at work and a community is gathering from Tonopah, Candelaria and adjacent points. The name given to the embryo town is Weepah, which means, in Indian, "Rainwater," in contradistinction to Tonopah, or "Brushwater."

LINCOLN COUNTY.

J. E. & S. Bamberger of Salt Lake City, Utah, have an option on DeLamar's gold mines and mill at DeLamar for $1,000,000.

Farrell & Rice will work the Old-Timers', near Pioche. The group was profitably operated, notwithstanding the haul of 40 miles to transportation. In the stopes is ore that will yield $20 per ton, with the advent of the locomotive, reduction works conveniently located. At numerous properties in the old camp an outlet for the ores Is all that is required to place them on a most productive basis. The old grade, which was made hy the Union Pacific when it sought a way into Nevada, has been repaired to a point within a mile of the town of Pioche.

LYON COUNTY.

Nine men are employed by the Heather M. Co.'s cyanide plant, near Dayton. A 15 H. P. motor is heing installed to furnish power fo the plant, the power being taken from the Truckee General Electric Co.

A strike is reported in the Oest mine at Silver City.

NYE COUNTY.

At Wilmington, Dela., a charter is granted to the Tonopah Water & Power Co., capital stock $1,500,000.

Sale of the Tonopah T. & M. Co has been made to Boston capitalists, price $250,000. It is said the new company will sink a double-compartment shaft 500 feet.

The new smelter at Gardnerville will be in operation June 15th. —— The Poco Tiempo mine at Alkali lake, 40 miles south of Carson, will have a new mill by July 4th.

STOREY COUNTY.

Work will probably be resumed in the Hulley-Logan mine this month.

The work of driving the drain tunnel on the North Rapidan is still progressing; this tunnel may be as important a factor in draining the mines of that district as the Sutro tunnel on the Comstock.

NEW MEXICO.

GRANT COUNTY.

The Owl mine, in Gold gulch, 5 miles from Santa Rita, has heen bonded to H. Finch and associates of Colorado.

The La Corona G. & C. Co. has bought the St. Josephine and Little Gem claims in Gold gulch. On the St. Josephine the lead is 10 feet wide and assays $50 to $75 per ton gold and several ounces silver. Picked samples pan $160 gold. The La Corona Co. has ten claims.

LINCOLN COUNTY.

At Parsons, Bonito district, the Eagle M. & Im. Co. has in contemplation a cyanide mill. J. M. Rice, manager, says that everything is in readiness to proceed on the plans outlined. The first step will he to huild a dam across the Bonito. When the dam is completed work upon the cyanide plant will be started.

At Nogal the Pennsylvania owners of the Helen Rea mine hold forty-two patented claims and expect to work several of them on a large scale, work to start as soon as their new machinery is placed. The American mine yielded recently out of a mill run of seventeen tons, value $50 to the ton. J. H. Lloyd is preparing considerahle work.

SANTA FE COUNTY.

The smelter at Cerrillos has been blown in. The company operates its own coal mine on Pecos Forest Reserve. Recent alterations and additions have made the smelter complete and up to date. The capital has been furnished by Pennsylvanians. Many mines idle for a long time are now supplying ore to the smelter.

The Santa Fe G & C. Co is prospecting its mines at San Pedro with a diamond drill.

The Ingersoll mine has hegun regular shipments to tlie Cerrillos smelter.

OREGON.

BAKER COUNTY.

The two 10,000-pound boilers for the Badger group of claims in the Susanville district are in position. The mill, when completed, will have a capacity of thirty stamps. The property was purchased three months ago hy F. R. Bradley for the Bunker Hill & Sullivan Co. The pay streak of the Badger is from 1 to 10 feet wide.

The April cleanup from the North Pole mine, Cracker Creek, is $80,000 from twenty stamps ——The Red Boy-Concord at Lawton reports $52,000.——From the Virtue mine $15.000 is reported for April.

Manager Meikle of the Golconda mine, at Sumpter, is testing an interesting theory regarding the dimensions of the Golconda ore shoot. It was struck on the 200-foot level; for 120 feet a ledge averaging 18 feet was entirely stoped hetween the walls. The first of the shoot was struck at the convergence of a small vein with the big east vein. It continued in both these veins till they met again, 120 feet distant. Drifting south of that point was continued 300 feet, and also north. Mgr. Meikle has concluded that the rich shoot dipped to the north, as it occurred at the convergence of the two veins, and wbile the strike of these brought them together on the 200-foot level, they dipped east and west, thus causing the point of convergence at the north end to extend farther north as depth was attained. Development is now being pressed to demonstrate these conclusions.

A Sumpter report says that the strike in the Golconda mine proves greater. The winze sunk from the 200-foot level has opened up the ore shoot which was first discovered in 1899 and afterward lost. There is a pay streak of free-milling ore. The Golconda was sold recently to a syndicate of Pendleton people and J. H. Robbins of Sumpter for $300,000 cash.

The Phœnix Co. at Baker City, C. Parker manager, is to start operations at the mine again.

JOSEPHINE COUNTY.

The Eureka mine on Briggs creek, near Grants Pass, has been bonded at $75,000 by the Victory G. M. Co., W. J. Morphy of Cbicago, Ill., manager and principal owner. The main shaft is down 400 feet drifting has exposed an 8-foot ledge, average value $15 per ton.

The Green & Harmon mine on Galice creek is working in a high hank now, as the gravel below is rich in coarse gold it pays to run the top stuff off.

A smelter and plant for treating copper ore has arrived for the Sowell copper mines of Waldo. These mines were hought some months ago by the Mountain Copper Co., who have developed them, presenting a body of copper ore.

Captain Mendenhall, owner of Roaring Gimlet mine, Gold Hill, has twenty pounds of amalgam, the result of three days' work on the vein. This gold was saved by simple panning.

SOUTH DAKOTA.

CLARK COUNTY.

The Realization, Penohscott and Smoky City groups at Garden City have been sold for $250,000. F. R. Byrnes of Deadwood will be manager. New machinery will be installed and a 100-ton cyanide plant erected.

LAWRENCE COUNTY.

The Pluma mine shaft has penetrated a hody of ore 300 feet wide, averaging $6 per ton.

The new Ellison hoist of the Homestake will be completed June 15.

The following cyanide plants are at Deadwood: Dakota cyanide plant: Milling 100 tons daily, netting $4000 monthly; crushing with thirty stamps in cyanide solution. Imperial M. Co. cyanide plant: 150 tons daily, on ores from American Express and Imperial groups and Ruhy Basin ore of Horseshoe M. Co; this plant, built on level foundations, handles ores by elevators and conveyors; roasters are being installed to handle ores from Eagle Chief and Juno groups, near Crown Hill; when complete, the mill will treat 250 to 300 tons daily. The Golden Reward Co. has a 300 ton cyanide plant ready for operation. The Rossiter cyanide plant is working under lease on ores from the Buxton and Big Bonanza mines near Terry; Supt Dorr.

The proposed new plant of the Horseshoe M. Co. at Pluma is announced "to be the largest crushing cyanide mill in the world." It will treat 1250 tons of ore daily. The Homestake plant at Lead has been treating tailings. There is no machinery in the plant at Lead aside from that used in handling the tailings and the apparatus for precipitating and discharging; tbe charging and discharging are accomplished hy water and gravitation and the agitation by the pneumatic process. To crush 1250 tons of ore daily would require 300 stamps. By crushing in the solution 40% to 60% of the values in the ore can he extracted In the hatteries.

PENNINGTON COUNTY.

P. T. Grantz of the Grantz G. M. Co. has let a contract for 100 M feet of lumber for a shaft house, ore bins and timhering the St. Elmo mine. The company has begun a two-compartment working shaft to cut the ore hody in the old workings of the St. Elmo Co.

Tbe National smelter at Rapid City has been blown in. Dr. H. H. Muggely is general manager and T. Knutzen Supt. and metallurgist.

UTAH.

BEAVER COUNTY.

The Ophir Hill Con. M. Co. at Ophir will equip their mine with a 300 H. P. electric plant.

IRON COUNTY.

Iron ore has heen discovered in Willow Creek canyon, 9 miles northeast of Parowan. The ledges are 5 to 50 feet wide.

In the Iron Springs mining district, Frew, Thompson & Page Bros. have disposed of the Reporter, Little Chief, Black Dwarf, Last Chance and Iron Duke iron claims for $44,000, and the Excelsior Iron Co. has conveyed to the Excelsior Iron M. Co. 118 acres of placer ground for $100,000, and the heirs of the T. Taylor estate are grantors to 140 acres of placer ground for $175 000.

Plans for the new mill with which the Johnny of Stateline is to be equipped contemplate a plant of a capacity of thirty tons daily, provision will be made for an enlargement.

JUAB COUNTY.

Following is an approximate estimate from the Herald of the tonnage in sight in each of the Tintic mines named which can he moved at a profit under reduced freight and smelter charges:

Mine.	Number Tons in Sight.
Star Consolidated	125,000
Swansea	125,000
Uncle Sam	100,000 to 125,000
South Swansea	100,000
Eagle & Blue Bell	100,000
Bullion-Beck	100,000
Centennial-Eureka	75,000
Godiva	75.000
Grand Central	75,000
Lower Mammoth	10,000

These estimates are furnished by men

connected with the properties. In addition, the Mammoth and May Day have large tonnages which it is not proposed to mill, but which might be shipped. The Yankee has a large tonnage of second-class ore, and so have Ajax, Gemini, Eureka Hill and Carisa. Other properties, such as the Joe Bowers, Emerald, United Sunbeam and Alaska have more or less second-class ore. All of the properties in Tintic have in sight, according to a careful estimate, a total of not less than 1,500,000 tons of ore not over $15 in value per ton, and of high enough grade to pay to ship with a reduction of $4.50 to $5 a ton in freight and treatment charges. It is said that this ore average $12.50 a ton. The total valuation of the tonnage affected is therefore over $18,750 000, which amount will be put into circulation if the ore is shipped.

A reduction of $1 a ton in the freight charges on low-grade ores from the Tintic district to Salt Lake valley smelters is announced by the railroads, effective on June 1st. The smelters have promised to reduce smelting charges $3 50 to $4 a ton, provided the railroad companies would make the reduction they have just announced. This will make a difference of $4.50 to $5 a ton on the freight and treatment charges on ores not exceeding $15 a ton in gross valuation. It is estimated that there are now exposed in the mines in the Tintic district 1,500,000 tons of ore that can be shipped at a profit under the reduced charges. This reduction, therefore, means a difference to the mine owners of the district of over $7,000,000 in freight and treatment charges.

The freight charges are reduced from $2.50 to $1.50 a ton. If the smelter charges are reduced to an average of $8.50 a ton, as promised, the freight and treatment charges will be only $10 a ton, leaving a margin of $5 a ton on $15 ore for mining, wagon haul and profit. It is impossible to tell accurately just what the second-class ores will average in value, or what the profit will be, but experts estimate that this step means a profit of $5,000,000 on ores in sight in the camp, from which must be deducted the cost of mining and wagon haul. In addition to reducing the tariff on the silver, lead, gold and copper ores of the camp, the Oregon Short Line and the Rio Grande Western will haul iron ores from Tintic for flux for $1.25 a ton instead of $1.85. This is to meet the objection of the smelters that the Tintic ores are so siliceous that the smelters must charge a penalty because of the difficulty in securing sufficient iron for fluxing. There is now only one possible hitch in the arrangements to allow the Tintic mine owners to ship their low-grade ores—the refusal of the smelters to carry out their repeated promises to reduce the treatment charges. If the smelting companies do not keep this promise by June 1st, when the new smelter at Murray starts up, it is probable that the railroad companies will withdraw this rate. Under the new arrangement ores will be billed at $2.50 a ton, as before. Upon the presentation by the smelter of the certificates showing the ore to have a value of $15 or less a ton, the railroads will grant a rebate of $1 a ton. The owners of the Tintic mines have thus been granted something for which they have been struggling vigorously for years. Nearly every property in Tintic will be affected by this move.

SALT LAKE COUNTY.

The trial run of the new converter plant of the Bingham Con. smelter is reported a success. This will enable the company to ship ore to market in form of copper bullion and effect a saving in treatment and freight charges. The plant has a capacity of 600 to 700 tons.

The Bingham Consolidated has forwarded its first consignment of copper, gold and silver bullion to the refinery at Perth Amboy, N. J., to be disposed of under the contract with the United Metal Selling Co. The Bingham product averages 45 tons daily.

SUMMIT COUNTY.

At the Crescent hill, Park City, properties of the recently formed Kearns-Keith Co., active operations have begun. Three shifts are at work on both the Alliance and Hanauer tunnels. M. J. Dally will be manager.

TOOELE COUNTY.

At the Con. Mercur, in Lulu ground, where the largest bodies of ore have been opened up, there has never been a time when so much ore was exposed. The output is averaging nearly 1000 tons daily, the ores are maintaining a fine average. At the Sunshine's new mill a saving of 90% is reported, with the filter presses adding much to its success.

M. H. Walker and C. H. Scheu have bought the Vulcan group of claims at Stockton for $35,000.

At the Sunshine mill 115 tons go daily through the crushers.

The Annie Laurie Co. at Kimberly is producing $2000 per day from its cyanide plant. Electric power is to be installed.

WASHINGTON.

STEVENS COUNTY.

The Northport smelter may be closed down temporarily. In consideration of the fact that 24,528 tons of ore mined during the month of March were estimated to yield a profit of only $9950, the directors cabled Manager MacKenzie asking whether it would not be politic to conserve ore reserves pending reduction of working expenses. He says that while copper and silver are at present prices and fuel and freight at present rates the March grade of ore leaves no profit, and he has already begun to sort the ore more closely, making April grade up to $10.50 per ton. He also reports that he is experiencing difficulty with smelting operations and has reason to believe a considerable percentage of the copper contents is not being recovered. He is, therefore, going to clean up at the smelter to ascertain to what extent this is so. A probable further reduction in the working force of the Le Roi is involved. An estimate has been made that the Trail smelter, with its decreased costs for coke and other advantages, could handle Le Roi ores for $1 per ton less than the Le Roi smelter can do the work and still make a profit. Le Roi ores may be diverted to Trail for a time.

SNOHOMISH COUNTY.

At Index work has begun on the Big Bee mine, owned by W. S. Lovejoy of Wallace. The ore is yellow pyrite and runs well in copper.

On the Chicago group work has begun. J. Walter is the owner.

The concentrator of the Ethel mine is in working order. Manager Pounder says he will build an addition to the concentrator, to make room for two more jig tables, which will increase the output of concentrates to double the amount, the tables being ordered already. There are concentrates sacked, ready for shipment, each sack weighing 125 pounds.

FOREIGN.

AUSTRALIA.

Sydney reports the discovery of a large and rich lode of cinnabar at Yass. Up to 1899 a little quicksilver was produced in that State; in that year a company was formed in Sydney to open and work the cinnabar mines at Ewengar. These mines are now being worked. Cinnabar lodes occur at Cardwell on the Cudgegong river and on the Tambaroora and Turon rivers. To encourage cinnabar mining the department of mines will give a reward of £500 to whoever produces the first 50,000 pounds of quicksilver from cinnabar ores mined in New South Wales. This reward will lapse if not claimed within five years from Jan. 1, 1902.

BRITISH COLUMBIA.

The Cascade Water Power & Light Co. has made a contract with the Granby Co. to supply from 1000 to 1500 H. P. for running the drills and operating the hoists in the Granby mines at Phœnix. If the service is satisfactory the Granby Co. will abandon steam power.

The big rock crusher recently installed at the B. C. Copper Co.'s Mother Lode mine, near Greenwood, has been started up. The ore is trammed by mule power through a tunnel run in below the ore quarry, having been first loaded through a chute into three-ton capacity cars. At the crusher a pneumatic hoist lifts the full car and tips its contents into the crusher hopper. A grizzly allows all the ore below 5 inches in size to drop through into the pit, the larger pieces falling into the same pit after being crushed. The ore is elevated thence by a bucket elevator to the ore bins alongside the railway track, and loaded into the railway cars for hauling to the smelter. The crusher has a capacity of 850 tons of rock, crushed to a size not exceeding 5 inches, every ten hours.

The Albion M. Co., which is operating near Ainsworth, has arranged to buy the Pearl claim, which adjoins the Albion, from D. F. Strobeck for $10,000. This will give the Albion Co. several hundred feet more ground along the vein. The company is exploring by means of a diamond drill.

At the Lenora mine the 90 H. P. boiler is being bricked and the 5-drill air compressor is being installed. The installation of the sorting machinery has been completed. A hoist will be erected in No. 2 tunnel, to be run by compressed air, for work in the double-compartment shaft, which the company are sinking to a depth of 200 to 300 feet below No. 3 tunnel.

R. A. Brown, from development work on the Wolverine, at Greenwood, has made an experimental shipment to the Granby smelter and reports that he has crosscut 25 feet of solid shipping ore without encountering a hanging wall.

MEXICO.

SONORA.

The Westinghouse Electric Co. is reported to have purchased copper mining property in Sonora, price $125,000, and to have paid down $25,000, the remaining $100,000 to be paid in one year.

YUKON TERRITORY.

DAWSON.

Advices from Dawson are to the effect that the country is drenched with water, sluicing has begun and it is estimated $10,000,000 to $15,000,000 in dirt is ready to wash. Summer work will be heavier than ever, especially on El Dorado and Bonanza.

Personal.

A. L. ROBINSON is Supt. Eclipse mine, Ophir, Cal.

J. M. BURKE, of Burke, Idaho, is in Tonopah, Nev.

H. ARGALL is Supt. Cosmopolitan mine, Groveland, Cal.

J. KING is Supt. Farington mine at West Point, Cal.

T. DONOHUE is Supt. of gold dredging operations at La Grange, Cal.

T. MCSORLEY is Supt. of the Easy Bird mine at Railroad Flat, Cal.

R. RESTANO, Supt. of the Golden West mine, near Sonora, Cal., has resigned.

A. SYDNEY ADDITON has returned to San Francisco from Confidence, Cal.

GEO. E. WERNER, assayer and metallurgist, has returned to Telluride, Colo.

W. DUFFY is Supt. Sailor Canyon and X Ray gravel mines, near Westville, Cal.

EDGAR RICKARD is acting consulting engineer El Progresso mines, Lower California.

E. KIDWELL, representing the Stirling boiler, has returned from Globe, Ariz., to San Francisco.

C. PARKER, manager of the Phœnix mine, near Baker City, Or., has returned from New York.

G. KNUTZEN is manager Dardanelles and Bob Lewis gravel mines, Damascus, Placer county, Cal.

S HAMILTON GUYOT is Supt. Dawes lode, adjoining Stratton's Independence, Cripple Creek, Colo.

HUGO VON BERCKENFELDT is now Supt. New York & Sonora M. & S. Co., Las Cruces, Mexico.

G. E. BAILEY AND O. S. BREESE of the California State Mining Bureau, are at Johannesburg, Cal.

H. D. LANE, general manager White Hills, Ariz., mines, has returned there from Los Angeles, Cal.

L. NIXON, of Jackson, Cal., has been appointed Supt. of the Nixon P. M. Co., near Sutter Creek, Cal.

C. L. WELLINGTON, traffic manager Colorado & Southern Railway, has returned to Denver from California.

M. BOWERS, Supt. Valley City G. M. Co., operating the Shurtleff No. 2 on Bull hill, Cripple Creek, Colo., has resigned.

DANA HARMON, formerly of Gaston Ridge, Nevada Co., Cal., is now permanently located at 616 Hayward Building, San Francisco.

A. R. WILFLEY, of Denver, Colo., is in Washington Camp, Arizona, getting the new mill and smelter at the Pride of the West mine in operation.

W. S. HASKENS, Supt. of the Iron Mountain mine of the Mountain Copper Co., at Salee, Colo., will be succeeded by C. F. Nourse, the present Asst. Supt., on June 1st.

F. M. WOODS, general manager Gold Coin, Doctor-Jack Pot, United Gold Mines and Woods Investment Co., Colorado, has gone to New York for a month's vacation.

B. TREWEEK has resigned as assayer and chemist for Clover Leaf M. Co., at Roubalx, S. D., to take similar position with Globe M. Co., at Lead, Lawrence county, S. D.

JAMES LAWLER, recently at Searchlight, Nev., for the Improvement Co., is now in Nacozaria, Sonora, Mexico, having been appointed master mechanic for the Copper Queen Con. M. Co.

W. C. RALSTON, a representative California miner, who so ably filled a place in the last California Legislature, is now a candidate for State Senator in his district. Such men are needed, as they do much real good in properly representing the mining industry.

Obituary.

ROBT. BURNHAM, a well-known Arizona assayer, died at Nogales, Ariz., May 12th.

Catalogues Received.

The Canda improved self-locking cam is the subject of an illustrated treatise issued by the Chrome Steel Works, of which Geo. W. Myers, Hayward Bldg., San Francisco, is the Pacific coast representative.

ALL that a customer desires to know about pipe-threading machinery is to be found in the new catalogue issued by D. Saunder's Sons, of Yonkers, N. Y. The text, always clearly written, is illustrated with many cuts. Especial attention is called to machines driven by electric motors.

The New Process Rawhide Co., Syracuse, N. Y., send an illustrated booklet showing the merits of their noiseless pinions which supply a positive drive that will run silently and still be durable. Wherever metal gears are feasible there is a place for these goods, which give good service without the usual nerve-racking noise.

Handsomely bound in maroon and gold comes the new chain, sprocket wheel, elevating and conveying machinery catalogue of the C. O. Bartlett & Snow Co., Cleveland, Ohio. Its 140 illustrated pages contain much of interest to the miner and mechanical worker in the carrier, conveyor, elevator system and other departments of mine work.

From Eugene Dietzgen Co., 181 Monroe St., Chicago, is received a copy of their new catalogue of drawing materials and surveying instruments, which contains description of an extensive line of drawing, tracing and blue print papers, mathematical instruments, scales, protractors, T squares, etc., and surveying instruments. A number of new and useful instruments and other devices for the use of the mechanical and civil engineer are shown, also electric light printing machines. The San Francisco office is at 508 Market St. The New York office 149 Fifth Ave. A copy of the catalogue will be sent on application to any address.

Books Received.

"Water Supply" (considered principally from a sanitary standpoint), by William P. Mason, Ren. Pol. Inst., 3rd edition, rewritten 1902, 8vo., 448 pages, forty figures, twenty-two halftone plates; cloth. Prof. Mason is a recognized authority, and this edition of his work is comprehensive, treated historically, scientifically and practically—a thorough work on the subject and its relation to life, particularly in centers of population. As a text-book it is complete; as a book of reference, invaluable, and to the lay reader an exceedingly interesting and instructive volume. John Wiley & Sons, New York, publishers. Price $4.

Commercial Paragraphs.

THE Jno. A. Roebling's Sons Co. has bought a tract of land near St. Louis, Mo., on which will be built an extensive branch plant for the manufacture of wire rope and cables.

THE offices and salesroom of the Pacific Tank Co. has been changed from 35 Beale St, San Francisco, to 301 Market St. On exhibit in the new office is a miniature cyanide plant, zinc lathes, wood tanks, wood pipe, etc.

THE A. Leschen & Sons Rope Co., St. Louis, Mo., will build a large factory and warehouse at Morin and Bulwer avenues, to be two stories high, 80x365 feet, warehouse (two stories) 75x150 feet, the cost of the buildings to be $78,000.

THE Burt Mfg. Co., of Akron, Ohio, report a recent shipment of their Cross oil filters to different cities in the Far East—India, China, Japan and the Philippine Islands. Other important shipments recently made by this firm went to England, Belgium, Mexico and Argentine Republic.

THE General Concentrates Co. contracted with the Modoc M. Co., Chicago, to remodel their mill at Las Cruces, N. M. Their mill originally was designed to treat their ore, a galena in the limestone gangue, in the ordinary way; on account of the scarcity of water they expected to be able to operate only 200 days in the year. The president of the company writes from New York city: "The mill was about completed when the attention of the officers of the company was called to the Hooper pneumatic concentrator in March. Operations were suspended while this system could be thoroughly investigated. One thousand pounds of ore were sent to our laboratory in this city and we made a test, saving their values in the form of a 75% concentrate. The Modoc M. Co. saw that installing the Hooper system of dry concentration they would not only be able to save a higher percentage of their values, but would be able to operate their

mill throughout the entire year, and placed their order for Hooper concentrators. The crushing machinery — jaw crushers and rolls—which is already at the plant, will remain, but new sizing machinery and seven Hooper pneumatic concentrators will be required. The work of remodeling the mill is under way."

Latest Market Reports.

SAN FRANCISCO, May 23, 1902.

METALS.

SILVER.—Per oz., Troy: London, 23¾d (standard ounce, 925 fine); New York, bar silver, 51⅝c, refined (1000 fine); San Francisco, 51⅜c; Mexican dollars, 44½c San Francisco, 41½c New York.

COPPER. — New York: Standard, $12.00@12.10; Lake, 1 to 3 casks, $12.50; carload lots, $12.25; Electrolytic, 1 to 3 casks, $12.30; carload lots, $12.00; Casting, 1 to 3 casks, $12.50; carload lots, $11.50. San Francisco: $14.00. Mill copper plates, $17.00; bars, 18@24c. London: £55 per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £11 12s 6d per ton.

SPELTER. — New York, $4.60; St. Louis, $4.00; London, £18 10s per ton; San Francisco, ton lots, 5¼c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN. — New York, pig, $30.00; San Francisco, ton lots, 31½c; 1000 lbs., 31¾c; 500 lbs., 31¾c; 200 lbs., 32c; less, 32½c; bar tin, ℔ lb, 37½c.

PLATINUM.—San Francisco, crude, $17 ℔ oz.; New York, $18 per Troy oz.

QUICKSILVER. — New York, $50.00 large lots; London, £8 15s; San Francisco, local, $47.00 ℔ flask of 76½ lbs.; Denver, $51.00. Export, $45.00.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16½c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.50; gray forge, $19.00; San Francisco, bar, 2.75 ℔ lb .,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $32 50; open hearth billets, $33.00; San Francisco, bar, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per bbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19.50; extra sizes higher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19.00; shingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1**, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11.75, long ton.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2¾@3c ℔ lb.; blue vitriol, 5¾@6¼c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2¼@ 2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c: caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 78c; cs., 83c; raw, bbl., 76c; cs., 81c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 68c; cs, 73c; raw, bbl., 66c; cs, 71c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13½c; Mineral Seal, iron bbls., 19c; wooden bbls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 15½c; do., cs., 21½c; 86° Gasoline, bulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 20½c; Lard Oil, No. 1 bbl., 60c; cs., 65c; Neatsfoot Oil, bbl., 70c; cs., 75c; No. 1 bbl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¾c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., per lb., 7½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¾c; do. in kegs, 7¼c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c.

ASSAY LITHARGE.—Per lb., 9c.

BISMUTH.—Subnitrate, per lb., $1.60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c; calcined, 20c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes—2¼ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Recently Declared Mining Dividends.

	Payable.
Butte Lode M. Co., California, 50 cents per share	May 3
Colorado Specie Payment G. M. Co., 2 cents, $13,500	April 23
Gold Coin, Cripple Creek, Colo., 3 cents, $30,000	May 25
Standard Con., Cal., 10 cents per share	May 22

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING MAY 13, 1902

699,829.—PUMP—J. Alhrefczenski, S. F.
700,009.—NOZZLE—J. Bean, Los Gatos, Cal.
699,830.—CARBURETOR—D. Best, San Leandro, Cal.
699,662.—PULLEY—L. C. Coulter, Portland, Or.
699,912.—HYDROCARBON LAMP — C. H. De Voll, Oakland, Cal.
700,163.—FILTER—J. W. Evans, Los Angeles, Cal.
700,039.—BURGLAR ALARM—Handy & Hosford, S. F.
699,755.—TRAIN ORDER BOX—I. G. Hoag, Los Angeles, Cal.
700,069.—SHOE DUSTER — W. G. Mullen, Pomona, Cal.
700,079.—POTENTIAL REGULATOR — R. A. Philip, Seattle, Wash.
699,712.—OVEN—F. Rademacher, Los Angeles, Cal.
699,822.—FURNACE—R. Scott, San Jose, Cal.
699,826.—RINGING PLOW—J. C. Silveria, S. F.
700,100.—DENTAL MALLET—J. W. Thatcher, S. F.
700,102.—WAGON—N. W Thompson, Bigelow, Or.
699,776.—IMPRESSION TRAY—E. L. Townsend, Los Angeles, Cal.
699,991.—STOVE—B. A. Vaughn, Corning, Cal.
700,106.—LOCK—Weber & Frey, Baker City, Or.

EXAMINATION OR SUPERVISION of Mines, Smelters and Mills.

Mining Engineer and Metallurgist, of unquestionable reputation and long experience, now permanently residing at Seattle, Wash., will examine or take general supervision of mines, smelters or mills, in Pacific Coast States, British Columbia or Alaska, as consulting engineer, for reliable parties. He also reliable accountant to examine. Box 813, Seattle.

HUBBELL, FREDERIC N.
MINING AND METALLURGICAL ENGINEER,
306 Pine St., Room 5. San Francisco, Cal.
Specialty: Gold & Copper. Bedford McNeill's Code.

SITUATIONS WANTED.

COPPER FURNACE FOREMAN with eight years' experience at matte and black copper work Best of references. Addrese V. H., care of Mining and Scientific Press.

PHYSICIAN AND SURGEON with three years' experience in both emergency and general hospitals, in addition to experience in mines and private practice, wishes position in a mine. Best of references. Addreee Box 126, care of this office.

CHEMIST AND ASSAYER, WITH TWENTY years' experience in mill and smelter work. Can run same. Address A. C., care of Mining and Scientific Prees.

THUNDER MOUNTAIN.—A successful superintendent of over 15 years' experience and acquainted with this district, deeires to take charge of property there for a good company. Addrees T. M., care of Mining and Scientific Press.

WANTED.—Poeition ae Foreman or Superintendent of quartz propoeition or developed mine. Timbering and air machine drille a specialty. Sixteen years' experience. No fake references furnished. Correepondence solicited. Present poeition not deeirable. Address T. J. P., care of Mining and Scientific Preee.

MINING ENGINEER, practical miner and mill man, assayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best referencee. Now working in southern California. Address A. M. P., care of Mining and Scientific Prese.

WANTED.—SITUATION AFTER MARCH 15, 1902, as Manager or Superintendent of mine. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work. Four yeare' experience as manager and superintendent. Treatment of low grade ores a speciality. Practical in every detail. State location of mine and salary. Best of referencee. Address X. Y. Z., this office.

A technically educated Mining Engineer, at preeent employed ae superintendent of mines for one of the largeet corporations in Mexico, desires a change of position to the United Statee about July 1st. Has bad 18 years' euccessful experience ae engineer and euperintendent, never having made a failure; 36 years of age; strictly temperate; a skilled designer, geologist and metallurgist, and a practical miner, as well ae a hard worker and thorough business man. Referencee of the highest order, including present employers. Addrese Supt., care this office.

WANTED.

Mine Blacksmith and Drill Sharpener to go to Hawaiian Islands—18 months. Unmarried man preferred; sober. Appiy by letter, with teetimoniais, to D. Y. Z., this office.

WANTED.—An Engineer and Mining Blacksmith

who understands repairing of machinery. Address "Quartz Mill," care Mining and Scientific Press.

Wanted to Bond a Dry Placer Claim, One Rich in Flour Gold.

Muet be a dry proposition. Address "Placer Claim," care this office.

WANTED TO BUY:

Interest in or all of a going Sampling Works, Ore Business, or Smelting Works. Addreee with partiouiars, L. X. D., Mining and Scientific Press, 330 Market St., San Francisco, Cal.

WANTED, for a developed mine in California, a competent mining engineer to look after development and exploration. Must be a full graduate of a recognized mining college and have had eeveral years' practical experience in large iron, coal or copper mines, and be fully skilled in the engineering problems pertaining to extraction, bauiage, ventilation, etc. Give full particulars of career, experience, age, etc, to "Vulcan," care of this paper.

A practical smelterman and metallurgist wanted, competent to handle a 250-ton matting plant, sulphide ore, in Arizona. Good opening for right party. State fully past experience and references.

Address "Matting," care of Mining and Scientific Press.

WANTED.

Consulting Mining Engineer,

familiar with making examinations of mines, prospects and mineral lands. Address stating experience and references. Moderate salary to start, with advancement to competent man. Position permanent if found eatisfactory. Address A., care of Mining and Scientific Press.

Wanted, Capital

to develop a group of mining claims recently discovered in northern California. Six lode locatione from 10 to 30 feet in width, carrying gold, silver and copper.

For further particulars, apply to

AUGUST QUITZOW,
CRESCENT CITY, CAL.

Quicksilver

BY THE FLASK OR CARLOAD.
WEIGHT AND QUALITY GUARANTEED.
The Eureka Company,
OF SAN FRANCISCO.
320 SANSOME STREET, - SAN FRANCISCO.

ASSESSMENT NOTICES.

SILVER KING MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Pioneer Mining District, Pinal County, Arizona Territory.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 17th day of April, 1902, an aeeesement (No. 24) of one ($1) dollar per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, 310 Pine street, Room 36, San Francisco, California.

Any stock upon which this aeeesement shall remain unpaid on the 27th day of May, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on TUESDAY, the 24th day of June, 1902, to pay the delinquent aeeeement, together with the coete of advertising and expenees of sale.

By order of the Board of Directore.

J. W. PEW, Secretary.

Office—310 Pine street, Room 36, San Francisco, California.

MARINA MARSICANO GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of worke, Sunny Hill, Shasta County, California.

Notice is hereby given, that at a meeting of the Board of Directore, held on the 21et day of April, 1902, an aeeesement (No. 29) of seven (7) cente per ehare wae levied upon the capital stock of the corporation, payable immediately in United States gold coin to the eecretary, at the office of the company, 217 Sacramento street, San Francisco, California.

Any etock upon which thie aeeeesement shall remain unpaid on the 20th day of June, 1902, will be delinquent, and advertised for eale at public auction; and unleee payment is made before, will be sold on FRIDAY, the 18th day of July, 1902, to pay the delinquent aeeeement, together with the coete of advertising and expeneee of eale.

By order of the Board of Directore.

CHAS. BOVONE, Secretary.

Office—217 Sacramento etreet, San Francieco, California.

DELINQUENT SALE NOTICE.

VIRGINIA CONSOLIDATED MINING COMPANY.—Location of principal place of business, San Francieco, California; location of worke, Kearearge Mountain, Inyo County, California.

Notice.—There are delinquent upon the following deecribed etock, on account of aeseement (No. 12) levied on the 2nd day of April, 1902, the eeveral amounte eet oppoeite the names of the reepective ehareholdere, ae follows:

Namee.	No. Cert.	No. Sharee.	Amt.
Amiraux, P.	281	50	$1 00
Benard, A. F., Truetee	53	227	4 54
Benard, A. F. Truetee	92	100	2 00
Benard, A. F., Truetee	286	1,000	20 40
Benard, A. F., Truetee	287	340	6 80
Benard, A. F., Truetee	288	300	6 00
Benard, A. F., Truetee	188	100	2 00
Chenot, Eugene, Truetee	111	504	10 08
Chenot, Eugene, Truetee	114	340	6 80
Chenot, Edward	237	400	8 00
Chenot, Edward	238	375	7 50
Obenot, Eugene E.	278	252	5 04
Chenot, Eugene E.	279	150	3 00
Chenot. Eugene E.	280	100	2 00
Chenot. Catherine	272	10,500	210 00
Chase, H. O.	282	100	2 00
Chase, H. O.	293	4,758	95 16
Denneine, Jno. H.	59	50	1 00
Denneine, Jno. H.	60	682	13 64
Bitterlin, Jos.	68	1,654	33 08
McGrath, P. F.	17	700	14 00
McGrath, P. F.	276	600	12 00
Mallon, Jno.	5	5 000	100 00
Mallon, Jno.	43	100	2 00
Mallon, Jno.	194	227	4 54
Mallon, Eilen	284	2,602	52 04
Mullen, Jno., Truetee	290	200	4 00
Sullivan, Michael	241	250	5 00
Warren, J. K.	187	454	9 08

And in accordance with law, and an order from the Board of Directore, made on the 2nd day of April, 1902, so many eharee of each parcel of such etock as may be neceeeary, will be sold at public auction, at the office of S. P. Middleton, 11 Montgomery etreet, San Francieco, California, on MONDAY, the 26th day of May, 1902, at the hour of 2 o'clock P. M. of said day, to pay said delinquent aeeeesment thereon, together with coete of advertising and expenses of eale.

B. A. BENARD, Secretary.

Office—147 Larkin etreet. San Francieco, California.

DELINQUENT SALE NOTICE.

LITTLE STANDARD OIL COMPANY. — Location of principal place of business, San Francisco, California; location of works, McKittrick District, Kern County, California.

Notice.—There are delinquent upon the following deecribed etock, on account of aeseement (No. 8) levied on the 4th day of March, 1902, the eeveral amounte set oppoeite the names of the reepective ehareholders, ae follows:

Names.	No. Cert.	No. Sharee.	Amt.
Geo. E. Whittaker, Trustee	5	5	$ 50
Edward McGarry	109	333	33 30
Edward McGarry	129	423	42 30
W. A. C. Smith	112	1,000	100 00
W. A. C. Smith	124	213	21 30
W. A. C. Smith	134	107	10 70
F. W. McNear	118	215	21 50
W. B Donnelly	135	5	50
J. H. Spring, Truetee	126	1,262	126 20
J. H. Spring, Truetee	127	1,262	126 20

And in accordance with law, and an order from the Board of Directors, made on the 4th day of March, 1902, eo many eharee of each parcel of euch stock ae may be necessary, will be sold at public auction, at the office of the company, Room 40, Chronicle Building, San Francieco, California, on MONDAY, the 12th day of May, 1902, at the hour of 2:30 o'clock P. M. of eaid day, to pay eaid delinquent aeeeesment thereon, together with coete of advertising and expeneee of eale.

R. L. CHENEY, Secretary.

Office—Room 40, Chronicle Building, San Francieco, California.

POSTPONEMENT.

By order of the Board of Directore the day of sale of the above delinquent stock hae been postponed to MONDAY, the 2nd day of June, 1902, at the same hour and place.

R. L. CHENEY, Secretary.

Office—Room 40, Chronicle Building, San Francieco, California.

Quicksilver

IN LOTS TO SUIT.
Write for Quotations.
REDINGTON & CO., 23-25-27 Second Street, SAN FRANCISCO, CAL.

MINING AND SCIENTIFIC PRESS.

Whole No. 2184.—VOLUME LXXXIV. Number 22. SAN FRANCISCO, CAL., SATURDAY, MAY 31, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Potent and Poetical.

A few years ago waterfalls were valueless except as "scenery." Now they constitute a potent source of energy and are proportionately valuable.

Better than competitive methods electrical development tends to clear the way for successful distribution of power. The ability to deliver on and from a wire the requisite power and light for an industry 150 miles from its source is a most potent factor in commercial success.

But "vandalism" is charged by lovers of landscape beauty, and the utilization of the cataract is by some considered sordid and destructive to its "poetry."

So much, however, depends on the point of view. There is as much real "poetry," as much food for fine fancy in a motor as in a natural waterfall. One is a splendid adaptation of intellect; the other is merely a gravitational action. Which spectacle produces the most beauty or satisfaction is a matter of opinion.

While, of course, it is sublime to see a mighty cataract pour over cliffs in thundering foam, yet it is of equal sublimity to see that same cataract through man's intelligence create a hundred homes, and while one can feel the poetry of nature in the iridescence of the waterfall as it plunges in its rainbow-sprayed flight, yet it is equally poetic and finely imaginative to trace the sunbeam as it draws water from the sea, note the breeze which carries that water to the mountains, observe the same water showered on the surface, coursing down to the plain, and guided through great wheels, creating electric energy that through the dynamo renews the same sunlight in a thousand lamps, and sets in motion a dozen busy shops; the sunlight thus completing a cycle of use and beauty that is grandly poetic and at the same time commercially creative. The bare waterfall is merely "poetic," the same waterfall partially used is potent and poetic too.

Deep Mining in South Africa.

A pamphlet compiled by A. P. Williams, Kimberly, S. A., shows the large number of American mining engineers now in important positions in South Africa, and since its compilation others have gone there from this country. While the Boer war was going on several returned, and with them came mining engineers, metallurgists and electricians eager to see all that was new in American mining methods and appliances. The cessation of hostilities this week makes certain the rapid resumption and extension of gold mining in South Africa, and prominent in connection therewith is the subject of deep mining in that region. The conditions are: the gold-carrying reef dips into the earth at an angle of approximately 35°, and long since proved its permanence in size and value to warrant laying out properties which will require vertical shafts to interset the reef at a depth of 7000 to 10,000 feet. Of course to a mining engineer there is no such word or condition as "impossible." The whole matter simply means that the greater the obstacle the greater the incentive to exertion and ultimate solution of any mining problem. These conditions were discussed at length in this paper three years ago, and it may be mentioned that the plan there and then proposed for the first time has met with affirmative consideration by many of the men to whom will naturally be delegated the work. The subject is referred to here and now merely because of its present timeliness. The first problem presented in deep mining on the Rand to a depth of 8000 or 10,000 feet is the fact that, in the ordinary way, with a single hoist at the surface, the rope, of whatever material it might be made, would have to be so strong to support its own weight that a limit would be reached at a depth of 5000 feet that would preclude possibility in that direction. The amount of power required, the weight of the rope and the size of surface appliances would make it "impossible" to sink 8000 or 10,000 feet direct hoist from the surface.

The idea is now generally accepted to have a hoist at the surface that would work to a depth of say 3500 feet; at that depth install a similar hoist, and at the 7000-foot level have a third hoist of like capacity, each set capable of raising six tons in each load with a hoisting speed of 2500 to 3000 feet per minute.

It would seem that the motive power will be compressed air or electricity, probably the latter. As the country is six months away from the manufacturers there can be little experimenting, as there is too much at stake. The whole subject has been pretty well threshed out and considerable practical work has been done in a tentative way—enough to demonstrate the feasibility of the main proposition.

Barrel Room, Portland Mill, Colorado City, Colo. (See Page 298)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

Chicago Office.....737 Monadnock Blk.
Denver Office.....606 Mack Blk.

J. F. HALLORAN.....Publisher.

San Francisco, May 31, 1902.

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THERE are two kinds of competition—emulative and antagonistic. Emulative competition is the strife between men for greater excellence and results in human progress. Antagonistic competition is the strife wherein man endeavors to injure his rival that he may succeed, and results in human retrogression.

A MACHINE cannot give off more power than is put into it in one form or another; the power given off is always represented by a fraction, that put into it being unity. This is due to the losses within the machine itself—that is, it takes some power to run the machine alone so that the power given off will be equal to that put into it minus the amount required to run the machine itself.

SUCCESSFUL competition of such a combine as the American Smelting & Refining Co. involves ownership of the raw material, ability to reach and maintain suitable market, and securing of requisite capital to extract and treat the ore. Such possibility exists, but it requires organization to make it effective and the ability to so organize constitutes an additional element that is of even greater value than the three designated.

ATTEMPTS have been made to protect gas pipes from electrolysis by covering with canvas and boiled tar, but destruction was more rapid with that coating than without, the earth seeming to delay electrolysis by absorption. Probably the best remedy is to reduce the return current through the pipes by laying conducting rails properly connected, or by using insulated return transmission cables leading back to the power house.

A SEATTLE, WASH., "MINING PAPER" of current issue has a prominent editorial announcement on its first page, wherein the publisher says he "will guarantee 12% per annum upon money invested according to our judgment" in mining stocks. To exploit or explode such a statement would be unnecessary to those who can understand it, and useless to those who can not. Doubtless there are people who believe such things, but they have not sufficient intelligence to read such a journal as this.

IOWA PAPERS exultantly announce that this year's corn crop in that splendid State promises to be greater in value than this year's gold yield of any nation. This is a grand showing and Iowa is to be congratulated. But the comparision is invidious. The "gold product of any nation for 1902" would be just as much and worth as much if Iowa never produced a bushel of corn. But what would Iowa's corn crop be worth were there no gold produced last year or this year or next year? No miner produces gold thinking how much Iowa corn he can get for it, but no Iowa man produces corn without figuring how much gold his crop will buy.

A MINING ENGINEER has constantly before him two great objects—first, to work his mine with the least possible likelihood of loss of life or injury to the men employed by him; second, to produce the minerals he is working at the least possible cost, having his first object—safety—always in view. In securing success in these two things he must, in a sense, have the co-operation of all his men; that is often gained by social influence and such general action as makes all connected with him in any way feel that they are viewed, not as mere machines, but thinking human beings.

GENERAL U. S. STATUTE 2400 allows the filing of an additional certificate of the location of a mining claim where the locator fears that his original location is defective, or if he desires to change his surface boundaries, or take in part of an abandoned claim. In the case of Duncan vs. Fulton, 61 Pac. Rep., Colo., 244, the court decided that where an original certificate sufficiently located a discovery shaft, and an additional certificate gave a description by metes and bounds starting with the discovery shaft, and running to posts in a mound of stone, the claim could be identified with certainty from both certificates taken together, and hence such certificates were admissible to establish the locator's claim, though neither taken alone sufficiently described such claim.

EXPENSE may be saved when putting in a small auxiliary engine by using a smaller steam pipe than the cylinder calls for, or by making the exhaust pipe one or two sizes less than the engine builder intended, and this may do, so long as the engine is not worked up to its full capacity; but when a full load is put on it the initial pressure will be much less than the boiler pressure, and it will grow less as the piston advances, because the small pipe can not deliver steam enough to maintain it. The small exhaust pipe may be sufficient to conduct the steam away without causing much back pressure, but this can not be known until the indicator is applied. The result is that the engine labors, the machine that it runs is not kept up to speed, and the whole arrangement is unsatisfactory.

"NEW and rare minerals" are being constantly "discovered," but, however interesting to a collector of curiosities, the matter has no general commercial importance. Just because a rare mineral is quoted at so very much per grain, or gram, or ounce, is of no avail in its production. Vanadium has been "discovered" over and over again. True, it is quoted at an extraordinarily high figure, but by the time it is in practical use it costs all it comes to. So, too, with cadmium, which is quoted at a high figure, but the use is limited, and ordinarily, when found in zinc ore, it is a nuisance, as it dyes all paint products a brilliant yellow. One little cadmium deposit can supply the whole world's demands therefor for twenty years, and the moment any other little lot appears the price would drop so fast and far as to make its production unprofitable.

ONE way a mine manager can make progress and get out of the rut is to go out in the world or the next county: anyhow to move around and see what other people are doing. If he vegetates and stays forever around his mine or mill he will cease to advance and that means to go backward, and that spells loss, for even if one makes a little profit he really loses if he doesn't make all that good progressive management should out of the business. A visit to neighboring plants is always productive of profitable operation, for no one knows it all. This is generally understood and acted on. It is a common occurrence to have a mine manager or a superintendent come into this office stating that he is "just looking around," and proposes to visit a number of mine establishments to get pointers. It pays in every sense to do so. Of course to the can't-get-away man the weekly visit arrival of this paper is considerable in the way mentioned, but even the interchange of ideas and the practical experience of others that he weekly finds therein, can be ably supplemented by personal contact and the benefit derived from brushing up against a brother worker in the same line.

THE law does not demand the recording of assessment work on an unpatented claim, but failure to make the record throws upon the miner a burden of proof, in the event of a contest, that he did the work, that at least demonstrates the desirability as a precaution of having the affidavit recorded wherever possible. In the event that the record was made, the person attacking it must make out a case strong enough to overturn the prima facie case that the affidavit is assumed to be. It is well to make the record, but not absolutely necessary. It is well for prospectors and other holders of mining property to bear in mind the general principle that it is best to secure one's self against attack wherever possible. In many hundreds of instances it is immaterial, as it happens, whether the precautions have been taken or not, but that is only because no one has taken the trouble or expended the fertility of resource necessary to find a possible opportunity and pick a flaw. The prospector who has faith in his mine—and where is there one who hasn't—ought to be as careful as if he knew that it would be a bonanza to protect himself against attack in the event that it does prove to be something worth fighting for. And where witnesses become scattered far and wide, as they do in the West generally, and particularly in the mining country, the record of the representation work is an anchor to windward, that costs comparatively little and may be eventually found to be worth much. W. S. Keyes, the veteran mine expert, tells of a recent case in Montana where he was a witness in a big mining suit in which the title to a property worth over $2,000,000 hinged upon the ability of the company to prove that certain work was done in 1874. There was no record and apparently all who could have proved it were dead. At last a man who knew the facts and was able to truthfully swear thereto was found in Bisbee, Arizona: one of the original locators and probably the sole survivor. He was brought to Butte and his testimony saved the company. "Suppose he had died?" says Professor Keyes. One thing is sure. Just as soon as a mining property becomes valuable litigation begins. Next to the ironclad potency of a U. S. patent comes the recorded proof that the requisite amount of work to hold the claim was done in and for any year.

TAKING as a text the line "a little learning is a dangerous thing," a contemporary argues that unless one can get a complete scientific education he is better off with none at all. This is a mistake—a little learning is not "a dangerous thing." It beats none at all; and the more scientific knowledge one has in mining or metallurgy, the better miner or metallurgist he is. Nowadays science is required in everything. There is science in buying a burro or sinking a shaft or making an ore car or building an air compressor. There is nothing secret nor sacred about science. Whenever one gets a new idea of any value he has acquired just so much more practical science. Science is simply organized knowledge, and the prospector or miner who never saw the inside of a "scientific" institution may exercise the latest scientific methods in his work—if he knows them. Ordinarily these scientific methods are learned by study and experience, by practice and observation; and whether the college or university be a crowded building or a lonely cabin or the 1200-foot level of a shaft, the real student is learning and acquiring "science" that will stand him in good stead all his life. The time has gone by when the pseudo scientist can sneer at the "common man," or the rank and file can justly hold aloof from the benefits conferred by real science. The true scientist is always anxious to have all enjoy the advancement afforded by general knowledge, and the progressive miner or mechanic or metallurgist is always eager for the further knowledge that can be acquired only by assiduous scientific study. And when it comes to terms, what is meant by "a little?" Were any of us able and willing to acquire continuous knowledge for a century of existence, he would then be possessed of but "a little," comparatively. Encouragement and not discouragement to scientific research is needed, and that silly line about "a little learning" being "dangerous" should be blotted out.

Concentrates.

ALLOYS of lead and copper are commercially valueless.

THE value of California's mineral production for 1900 was $32,622,945.

ONE H. P. will raise 8 cubic feet of water por minute 50 feet high, or 5.3 miners' inches.

THE revenue tax on mining stock certificates was repealed on April 12. The repeal takes effect July 1, 1902.

BARIUM suiphide is formed from witherite and suiphur by heating in a covered crucibie to duii redness for 30 minutes.

A SQUARE ditch 6.58 inches, running full of water at a velocity of 5 feet per second, will deliver 675 gallons per minute.

IRON at Birmingham, Ala., costs $16 per ton; the freight to San Francisco, Cal., is $12.75 per ton. The Pacific Steel Co. at Irondale, Wash., is now manufacturing pig iron.

AIR becomes liquid at 312° F. below zero; hydrogen at 422° F. below, nitrogen 317°, oxygen 297°. None of these liquid gases have any commercial use. Hydrogen has been reduced to a solid.

THE value of an oil well in California or anywhere else may be considered three times its net earning power in one year. The earning power of a well is about three barrels per day less than the gross output.

CALAMINE is a native carbonate of zinc, containing as high as 50% of the metal, and occurring abundantly; or a silicate of zinc, some mineralogists applying the name to the latter and calling the former smithsonite.

AT Savonas, B. C., are the only quicksilver mines under the English flag. At Nikitowka, Ekaterinoslav, are the only quicksilver mines under the Russian flag. In each case the average yield of the ore is less than 1%.

HYDROCHLORIC ACID is made by the action of suiphuric acid upon sodium chioride, gaseous hydrochloric acid being evolved and suiphate of soda formed. The solution of this gas in water is what is generally called hydrochioric acid.

WHEN a body is constrained to revoive around an axis it will describe the largest circle it is permitted to do, as a large circle differs less from a straight line than a small circle, and in any given advance of the body, therefore, it is less deflected.

WHEN the threads of a screw and its nut become worn a portion of a revolution of a screw is required before the nut begins to move. This movement of the screw, which is inoperative in moving the nut, because of the wear, is called "back-iash."

LAKE COPPER in the forty years from 1860 to 1900 touched its highest point in July, 1865—55 cents; its lowest in June, 1894—9 cents, New York price. Its highest figure in January, 1895, was 10 cents; its lowest figure that year was 9¼ cents, in March.

QUARTZ CRYSTAL cannot be used like glass on account of the high temperature required to melt it. Lenses are made from it by grinding, and in recent years fine silica fibers for physicai apparatus have been drawn out while the material was softened by the oxyhydrogen flame.

THE average value of gold produced is $17.375 per ounce troy, or .03.62 cents per grain, which gives a value of $253.40 per avoirdupois pound; $300,000,000 would give 1,183.89 pounds. Pure gold equals 1.206 pounds per cubic foot. Gold, at $17.375 per troy ounce, will weigh 1,117 84 pounds per cubic foot.

AS BETWEEN the proprietor of an establishment and his general workmen, the presumption of invention is with the workmen. Where one person is employed by another to reduce his ideas to practice, there is a strong presumption against the employe's having originated an improvement while in such service.

A SIMPLE test for the presence of gold is, grind the sample fine, put into a cup, pour over it tincture of iodine. Let the mixture stand covered. After three hours pour out on sheet of biotting paper, or better, filter through filter paper. If gold is present it will be indicated by a purple ring on paper around puip as iodine evaporates.

THE 1870 production of lead in the United States was 16,000 tons. Its highest price in New York that year was on August 25, $6.35 per 100 pounds. The 1890 production was 128,000 tons; highest New York price that year, Oct. 15, $5.87½. The 1899 production was 205,000 tons; highest New York price, December 20, $4.72½. The lowest New York price in thirty years from 1870 was Jan. 14, 1896, $3.02½.

HARVEYIZED STEEL and armor plate differ from other steel in being face hardened by a process in which the steel absorbs carbon. The piece of steel to be treated is put in a furnace while its face is covered with bonebiack and charcoai, the rest of it being sunk in sand. The temperature within the furnace is almost that which melts iron. Water is sprayed on the steel when it is taken out to chill it. Armor plates thus treated gain in their resistance to cannon shot from 50% to 100%.

A MAN locating a mining claim on Jan. 10, 1902, a second locating the same claim on Feb. 1, 1902, and a third locating the same claim on Feb. 11, 1902, the second and third would have to wait for the first man's time to expire—that is, till the original locator failed to conform to the requirements of the statutes. But the first locator has until Dec. 31, 1903, to do the necessary assessment work, and can not be legally dispossessed until Jan. 1, 1904, even if he does not do a lick of work on that claim, from now to Dec. 31, 1903.

A RETORT for small quantities of amalgam may be made by taking two clay pipes, break the stem of one close to bowl, plug hole with stiff clay; place amalgam wrapped in piece of cloth in bowl of pipe; place the second pipe on first, luting the joint with stiff clay; wire the two bowls together with iron wire, using pincers to twist the ends, and make firm joint; set cup under projecting pipe stem to catch the distilled quicksilver; heat over moderate fire at first and bring to red heat finally.

THERE are doubtless many points in Chile where copper could be mined in paying quantities. The ore is found in nearly all the forms known to nature, but the investments in these properties are comparatively insignificant. During the last twelve years manganese ores have been exported to the value of $14,273,896. The first shipments (4324 tons) were made in 1884. The amount of copper exported in 1899 was 35,854,439 kilograms (35,854 tons). The International Mining & Refining Co. of Huantajaya has offices at Iquique.

TO THE QUERY regarding the assaying of ore in which was considerable sulphur, answered some weeks ago, have been received a great variety of other answers. A Central City, South Dakota, assayer makes a comment that "Concentrates" does not note as common. He says: "In my experience with suiphur ores I use sufficient niter to oxidize the entire charge of ore. Then, when fusion has become quiet, I add a blank charge of flux, with the right amount of reducer to secure the desired button of lead, and, when fusion has again become quiet, pour."

THE formation in the gold fields of South Africa are peculiar. The gold is in reefs. These reefs are massive and made up of coarse granite conglomerate and sandstone, with here and there large or small cement seams. The gold is not in the quartz or sandstone, but in the cement. The streaks which carry the gold are from 6 inches to 60 feet in width, and almost invariably widen with depth. When the outcropping is first discovered it looks like a vertical vein, but soon flattens out on depth. The mining there is more like coal than gold mining anywhere else. Shafts are nearly all 16x8 or 16x6.

ROASTING an ore containing both gold and silver, and extracting the metals by amalgamation, is a standard and successful process, but is not continuously successful on an ore containing only gold. It can be done; the reason it has not been is largely because the roasting was not perfectly done. In the roasting the particles of gold become more or less coated with a film of suiphur, and this film prevents them amalgamating with quicksilver. It can be destroyed by a properly conducted roast, but this is seldom given. It is more difficult and requires more skill to roast a gold-bearing ore fit for amalgamation than for chlorination.

WHERE A took up two adjoining claims in August, 1900, and B later located two overlapping claims, neither doing any assessment work, C relocating A's two claims Jan. 1, 1902, the question as to "who owns the overlapping claims" has no significance, as they cut no figure. In any event, such property rights as are conferred by a valid prior location, so long as such location remains valid and subsisting, are preserved from invasion and can not be infringed or impaired by subsequent locators. To the extent, therefore, that a subsequent location overlaps or includes any portion of the surface held by another, to that extent such location is void.

THE idea that veins are branches of a great deposit that lies near the center of the earth, and that therefore they increase in richness as they increase in depth, is relegated to the century gone by. The theory that all veins were once open fissures is another dead one. Heat, cold, electricity, sublimation, infiltration and flowing waters are all recognized as agents that have worked and are working in nature's great laboratory as they work in the puny limitations that man has created to study his work. Just how they worked, what the influence of each one was in special cases, and how surroundings modified the results, form a volume that is being studied by many brilliant intellects. Their discoveries are leading to the end sought. No one knows their imperfections, and the missing links in the chain, as well as he who understands them best. He knows that they may never reach the end sought; but he also knows that they see into the rocks as far as another.

PROBABLY the largest nugget or mass of silver ever mined was a piece weighing 1340 pounds, which was taken from the Smuggler mine, Aspen, Colo., in 1894. In regard to this nugget, S. I. Hallet, of Colorado, wrote at the time: "The nugget in question formed part of a consignment of 15,031 pounds of ore, which with silver at 58 cents or thereabouts, netted us free and clear of all expenses, close to $82,000. This particular nugget was gotten out by itself, and seemed to be extremely pure. It was impossible to assay it in the ordinary acceptation of the word, and it was put directly into crucibles and the crucible returns given to us by the company. This streak of silver occurred as a core in some rich ore, averaging about 1000 ounces a ton. At times it would be ½ inch in thickness, and then widen out to 2 or 2½ feet. It was a little purer than a silver dollar and almost as bright. We were obliged to mine by the side of it, allowing it to hang down into the stope until we had reached a natural crack or thin place, where we could break it off. It extended along the stope 20 or 30 feet in height, was 3 or 4 feet in length, width as given. As to just how it was made it is hard to give a theory. It was sometimes found crystallized in connection with argentite, which might lead one to think that it had simply been argentite, and that by the enormous pressure exerted on it the suiphur had been expelled. Again were found pieces in which the outer surface was a thick mass of silver wire practically welded together, which would, of course, account for it in a different way."

AT the gas power plant of the Moctezuma Copper Co., Nacosari, Sonora, Mexico, two qualities of gas are produced in the generators, according as the fires are supplied with air or steam. There are two gas-holders, one with 6000 cubic feet capacity for water gas, the other 15,000 cubic feet capacity for producer gas. The two gases, when mixed in due proportion, operate the gas engines. At Morenci, Ariz., the Detroit Copper Co. operates a similar plant, the gas being piped one mile to the smelters, there supplying two 200 H. P. three-cylinder vertical gas engines, each belted to a 120 K. W. alternating current dynamo. The gas is also piped 2000 feet to the concentrating mill, there operating three 80 H. P. gas engines. The gas thus supplied can be made from either anthracite or bituminous coal, coke or wood by passing steam and air together or alternately through incandescent fuel deeply bedded, the gas so evolved being passed through water spray towers into tanks for use.

THE metal prices quoted in market reports for Great Britain represent the value in pounds sterling of an English ton—2240 pounds. Usually in this country the 2000-pound ton is the measure of weight, prices being ordinarily quoted in cents per pound avoirdupois, or dollars and cents per 100 pounds. The given price of any commodity, quoted in market reports, pounds sterling per 2240 pounds, can be readily converted into the equivalent into United States currency per 100 pounds by using this formula: $P = (P^1 \times E) \div 22.4$, in which P = price per 100 pounds in dollars and cents. P^1 = price in pounds sterling (shillings and pence being expressed in decimals of a pound), and E = the value of £1 in United States currency at the existing rate of exchange. For instance, on page 15 of to-day's market report spelter is quoted at £18 10s London. With exchange at $4.866, the equivalent in dollars and cents per 100 pounds would be computed as follows: £18 10s = £18½ (18½ × 4.866) ÷ 22.4 = $4.014. This formula will apply to any similar instance.

BLACK OXIDE of manganese is not converted into ferro-manganese, the latter being an alloy formed by the proper admixture of manganese ores with iron. Manganese imparts to iron whiteness and causes it to become hard and brittle. Alloys of iron containing up to 25% manganese are termed spiegel-eisen (mirror iron). With higher percentages of manganese, the grain of the composition becomes more uniform and granular and an alloy is obtained which increases in brittleness with increase of manganese. Alloys of less than 25% or 20% manganese are extremely brittle and hard. But when the percentage of manganese is doubled, alloys possessing different properties are the result, and exhibit a remarkable combination of hardness and toughness, and peculiar, in that while they resist the abrasion of the lathe tool they can be indented by an ordinary blow. A light grey color is a characteristic. To these mixtures the term ferro-manganese is given. The manganese ores (black oxide) are mixed so that if 75% of the manganese in the charge is reduced and 25% goes into the slag, the desired composition will result. It is not practicable in the ordinary blast furnace operations to reduce the whole of the manganese in the charge. To produce a ferro-manganese containing 86% manganese, a richer mixture than the above must be used, of which say 80% of the manganese is reduced and but 20% passes into the slag. Manganese steel contains 7% to 20% (more commonly 14%) manganese. Variations in percentage of carbon produce marked differences in characteristics.

BY cyanidation it is feasible to treat telluride ores, but the result will not compare favorably with the smelting returns. These ores are highly charged with suiphides, and with any process, such as chlorination, where roasting is necessary, a loss of gold will occur. To obtain a sweet roast is one of the most essential points for the successful extraction of the gold by chlorination, and to thoroughly roast these ores at the low temperature necessary to avoid a large loss of gold would occupy a great length of time, and is naturally expensive where fuel is scarce. With many of these ores the large amount of calcite in them would considerably increase the difficulties in treating with chlorine. The treatment by means of a battery and ordinary amalgamation is out of the question, as only the free gold will be saved, and in many cases the saving of the free gold itself would be very difficult, owing to its exceeding fineness. There are many proved methods, by means of which a greater percentage of gold can be obtained, from these ores especially, than by any methods of amalgamation. The term "refractory ore" is misleading, as it is usually applied to all ores that will not amalgamate easily, whether the battery is suitable or not, and whether the battery manager understands his work or not. A great number of so-called "refractory ores" carry little or no gold, and it is impossible to devise a practical method of treatment; but where there is gold, and in large quantities there are brains enough at work to find out the most suitable and commercial methods of treatment.

Nickel, Cobalt and Cryolite in 1901.

"Mineral Resources of the United States, 1901," published by the United States Geological Survey, will contain the report of J. H. Pratt on nickel, cobalt and cryolite for 1901.

The two principal sources of nickel are nickeliferous pyrrhotite, the most widely spread of the nickel ores, and gentbite. In this country the domestic product of nickel has been as a by-product from the lead ore of Mine Lamotte, in Missouri, since the shutting down of the Gap nickel mine in Lancaster county, Pa., 50 miles west of Philadelphia, ten years ago. This mine was worked from 1863 to 1880, when work was discontinued because of the abundant supply of nickel matte from Canada. Occurrences of nickel silicate are found in Oregon, Piney mountain, Douglas county, 3 miles northwest from Riddles.

Nickel ore is reported to occur in some quantity at the Congress mine, in Upper Nine-Mile section, 14 miles north of Keller, Ferry county, Washington. This section was formerly worked for copper and gold, but was abandoned. In the latter part of 1901 the claims were again taken up and are now being developed for nickel.

The Wyoming nickel ores near Sheridan, Sheridan county, do not seem to contain nickel in commercial quantity; at Piney creek, also, nickel ore is reported. Near the northern border of Churchill county, in Cottonwood canyon, 45 miles from Lovelock, Humboldt county, Nevada, deposits of niccolite and gersdorffite have been prospected as nickel ores; deposits are reported at Bunkerville, Lincoln county, and near Candelaria, Esmeralda county. They have not yet been producers of nickel ores. It is reported that the Magnetic mine, near Tucson, Arizona, contains nickel ores in quantity, and that they are now being investigated by Eastern capitalists.

Nickel ores are reported also as found on Spring creek, in the Black Hills, South Dakota, 11 miles northwest of Custer, and at the St. Joe mine, Blackbird, Lembi county, Idabo.

Nearly all the nickel used in the United States is from the mines in the Sudbury district, Canada, which produces one-half the nickel used in the world. The other chief sources of nickel are the mines of New Caledonia, in the Pacific ocean, and of Silesia, Austria.

The first use of nickel was in making German silver. Nickel is used extensively for coinage by the United States and many European countries. The most important use of nickel is in making nickel steel, now used in large quantities in the production of armor plates, turrets, propeller shafts and bicycles.

The only nickel and cobalt produced in the United States during 1901 were as by-products at Mine Lamotte, Missouri; the matte containing the nickel and cobalt was refined at Constable Hook and Camden, New Jersey. There were obtained 6,700 pounds of nickel, valued at $3,551, and 13.360 pounds of cobalt oxide, as compared with 9,715 pounds of nickel, valued at $3,886, and 6,471 pounds of cobalt oxide produced in 1900. This is a decrease of 3,015 pounds in the production of nickel, and an increase of 6,889 pounds in the production of cobalt oxide. Experiments have been made by the Canadian Copper Company to refine, in Canada, the nickel copper matte from the Sudbury mines, but thus far in vain, the greater part of the matte being refined in the United States.

The amount of nickel imported and entered for consumption in the United States in 1901 was 117,364,337 pounds, valued at $1,847,166, as compared with 57.955,988 pounds of nickel matte, etc., valued at $1,323,630 in 1900. The amount of nickel produced from matte and ore imported into the United States was 10,497,097 pounds, worth between five and six million dollars. The price of nickel oxide has been about 5 cents lower per pound than the metal, while the cobalt oxide has been sold at $2.20 a pound. The nickel industry is increasing, and there has been, also, increase in the amount of nickel used in the United States. The export of nickel oxide and matte from the United States in 1901 was 5,869,655 pounds, as compared with 5,869,906 pounds in 1900.

The amount of cobalt oxide imported into the United States in 1901 was 71,969 pounds, valued at $134,208, as compared with 54,073 pounds, valued at $88,651 in 1900. As the United States refines the greater part of the nickel matte produced at the Sudbury mines, naturally the United States exported nickel to the amount of 5,869,655 pounds in 1901, or 251 pounds less than was exported in 1900.

The production of nickel in Canada in 1900 was 8,729,000 pounds, valued at $4,364,500; in France the production was 3,746,800 pounds, valued at $1,020,000; in Germany it was 4,383,756 pounds, valued at $1,999,940.

Cryolite is a fluoride of sodium and aluminum. It is used sparingly in the manufacture of hydrofluoric acid, its greatest use being in the manufacture of aluminum and sodium salts. There is no cryolite produced in the United States, and it has been found very sparingly in only a few localities in this country; namely, at the southern base of Pike's peak, El Paso county, Colo., and in the Yellowstone National Park. All of the cryolite used is imported from Ivigtok, in Greenland, on the Arksuk fiord, one of the deep rocky winding bays which penetrate the steep mountain coast at intervals. The supply of cryolite is controlled by the Danish government, and there is imported into the United States each year from 5,000 to 10,000 tons, the imports in 1900 being 5,437 long tons, valued at $22,763, and the imports for 1901 being 5,383 long tons, valued at $70,886.

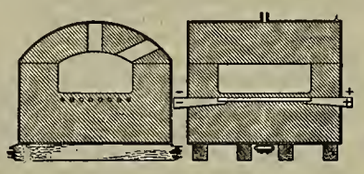
Electrical Roasting Furnaces.

When moderate temperatures (e. g., up to a white heat about 1400° C. = 2552° F.) are required, gas or solid fuel furnaces of well-known types are generally preferable, and certainly much cheaper under ordinary conditions. At still lower temperatures—for example, a moderate or a dull read heat—the case against the electric furnace is even stronger. One may, however, find instances when the use of the electrical furnace is practicable for very moderate temperatures. Already low-temperature electric furnaces are in successful use for laboratory purposes, and for the little muffles employed in mechanical dentistry. It is proposed to extend their employment, given suitable conditions, to larger industrial operations. In modern metallurgical practice it not infrequently happens that an ore of paying richness occurs in a district where fuel is dear or hardly existent, and the means of communication so bad that the cost of imported fuel becomes almost prohibitory by the time the fuel is delivered on the spot.

Such desolate regions, from the nature of the case, are generally mountainous and often abundantly supplied with water power. The enterprising exploiter of a property of this kind naturally turns to some electro-chemical process of treatment, and if the water power can be readily utilized without an unduly large expenditure for impounding, tunneling and the like, there is no reason why the absence of fuel should prevent the successful and profitable extraction of the valuable constituents of the ore. But it often happens that electro-metallurgical processes need some preliminary aid from older methods. Frequently, for example, the ore has to be roasted.

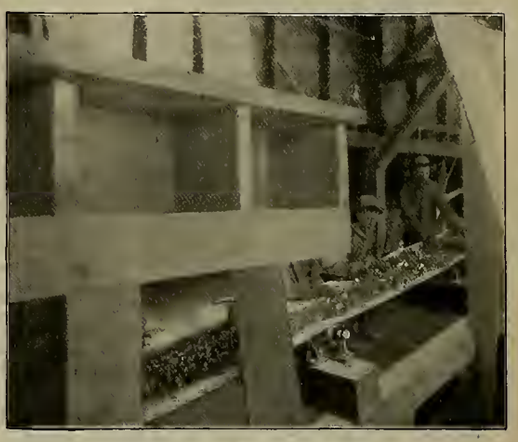
In the case now being considered, as fuel is very dear, an alternative mode of heating is desirable, and this can be secured by an electrical method. The cost even with cheap water power would be excessive under ordinary industrial conditions, but in the special circumstances cited it may fall within moderate bounds.

As long ago as 1883 Faure patented a furnace, an illustration of which is here shown, designed for raising the temperature of a charge lying on the hearth of the furnace by heat generated in a continuous conductor embedded in the sole of the furnace. An obvious alternative is to let the conductor lie on the hearth itself or to embed it partially. This furnace was intended for the manufacture of sodium. It will serve here as an example of a simple method of internally heating a reverberatory furnace suitable for roasting operations. It would be easy to devise other forms to meet special needs. The temperature required is so moderate that the practical difficulties are smaller than most of those encountered in electro-chemical work. Without being conclusive as to the design of such a roasting furnace, it would seem that a firebrick hearth, in which grooves were chased so that iron rods of fairly large sections were embedded nearly flush with the level of the hearth, would serve as well as more elaborate contrivances. One should use a low pressure and a heavy current, so that the iron rods might be stout enough to resist wear and loss by oxidation. They could be easily and cheaply renewed. Systematic roasting in a revolving calciner, instead of on a fixed hearth, needing rabbles and much hand labor, would be accomplished at least as easily as any form of roasting by fuel in a similar apparatus. Roasting furnaces needing ploughs or rakes dragged over the hearth mechanically to stir the ore would be better suited by the electrical method of heating than by the usual roasting processes. The wear and tear of such form of mechanism is heavy, and is largely due to their exposure to the fire gases which heat the ore. With an electrical roaster this would be changed, the sole of the furnace being the hottest part, the ore the next, and the plough, or stirrer, remaining fairly cool. There are certain possibilities in the electric roaster when power is sufficiently cheap and fuel is sufficiently dear.—Bertram Blount in Electrical Review.



Jeffrey Sorting Belt Conveyor.

The accompanying illustration shows a Jeffrey "Century" belt conveyor used as a sorting table at the mines of the Colorado Fuel & Iron Co. This outfit consists of an extra wide Century conveyor belt, having its carrying side reinforced with an extra thickness of a special rubber covering for resisting the abrasion of the material. The belt is supported on special troughing carriers, concaving the belt sufficiently to prevent the material from rolling off. The belt is operated at a moderate speed, which enables the pickers to take the impurities from the product while in transit. These sorting tables are used successfully for different purposes, also for carrying large or small quantities of material from one place to another. They can be operated horizontally or on an incline up to 25° or 30°, if desired. The above conveyor was furnished by the Jeffrey Manufacturing Co. of Columbus, Ohio, which supplies this class of material for the handling of coal, ores, sand, quartz tailings, crushed stone, sulphite chips, clay and for a variety of other purposes. This company also manufactures a complete line of chain elevating, conveying and power transmission machinery. Its new and handsomely illustrated catalogue (No. 67) on "Century" rubber belt conveyors can be had upon application. Frank R. Field, Equitable Bldg., Denver, Colo., is the Western agent.



Jeffrey Sorting Belt Conveyor.

Daylight in the Klondike.

Following is a table of sunrise and sunset in the Klondike. It is computed for every tenth day in the year and is correct to the nearest minute.

The table shows that the shortest day at Dawson is the 21st day of December, on which day the sun rises at 10:13 A. M. and sets at 1:47 P. M., an interval of only 3 hours and 34 minutes. The longest day falls on June 21, when the sun rises and sets at 1:47 A. M. and 10:30 P. M. respectively, the sun remaining above the horizon for 20 hours and 26 minutes. On the 21st of March and September the days and nights are equal, as they are in all latitudes.

	Chilcat Pass. (Lat. 59-50.)		Dawson. (Lat. 64-05.)		Circle City. (Lat. 65-24.)	
Date—	Rises. A. M.	Sets. P. M.	Rises. A. M.	Sets. P. M.	Rises. A. M.	Sets. P. M.
Jan. 1.....	9:06	2:54	10:02	1:58	10:29	1:31
Jan. 11.....	8:53	3:07	9:39	2:21	10:01	1:59
Jan. 21.....	8:33	3:27	8:49	3:11	9:27	2:33
Feb. 1.....	8:07	3:53	8:36	3:24	8:47	3:12
Feb. 11.....	7:42	4:18	8:04	3:56	8:13	3:47
Feb. 21.....	7:15	4:45	7:31	4:29	7:37	4:23
March 1.....	6:54	5:06	7:05	4:55	7:09	4:51
March 11.....	6:26	5:34	6:32	5:28	6:34	5:26
March 21.....	6:00	6:00	6:00	6:00	6:00	6:00
April 1.....	5:30	6:30	5:24	6:36	5:22	6:38
April 11.....	5:03	6:57	4:52	7:08	4:48	7:12
April 21.....	4:37	7:23	4:20	7:40	4:13	7:47
May 1.....	4:11	7:49	3:47	8:13	3:37	8:23
May 11.....	3:46	8:14	3:14	8:46	3:02	8:58
May 21.....	3:23	8:37	2:43	9:17	2:26	9:34
June 1.....	3:03	8:57	2:13	9:47	1:50	10:10
June 11.....	2:51	9:09	1:54	10:06	1:24	10:36
June 21.....	2:47	9:13	1:47	10:13	1:18	10:45
July 1	2:52	9:08	1:56	10:04	1:27	10:33
July 11.....	3:05	8:55	2:17	9:43	1:55	10:05
July 21.....	3:24	8:36	2:45	9:15	2:28	9:32
Aug. 1.....	3:49	8:11	3:19	8:41	3:07	8:53
Aug. 11. ...	4:14	7:46	3:52	8:08	3:43	8:17
Aug. 21.....	4:41	7:19	4:24	7:36	4:18	7:42
Sept. 1.....	5:10	6:50	5:00	7:00	4:56	7:04
Sept. 11.....	5:37	6:23	5:32	6:28	5:31	6:29
Sept. 21.....	6:00	6:00	6:00	6:00	6:00	6:00
Oct. 1	6:31	5:29	6:37	5:23	6:40	5:20
Oct. 11.....	6:58	5:02	7:10	4:50	7:14	4:46
Oct. 21.....	7:25	4:35	7:42	4:18	7:49	4:11
Nov. 1.....	7:53	4:07	8:18	3:42	8:28	3:32
Nov. 11.....	8:18	3:42	8:51	3:09	8:56	3:04
Nov. 21.....	8:40	3:20	9:21	2:39	9:39	2:21
Dec. 1.....	8:58	3:12	9:48	2:12	10:12	1:48
Dec. 11.....	9:10	2:50	10:07	1:53	10:37	1:23
Dec. 21.....	9:13	2:47	10:13	1:47	10:45	1:15

Costs and Profits in Pyritic Smelting of Low-Grade Copper Ores

NUMBER IV.

Written for the MINING AND SCIENTIFIC PRESS by F. H PRENTISS, E. M.

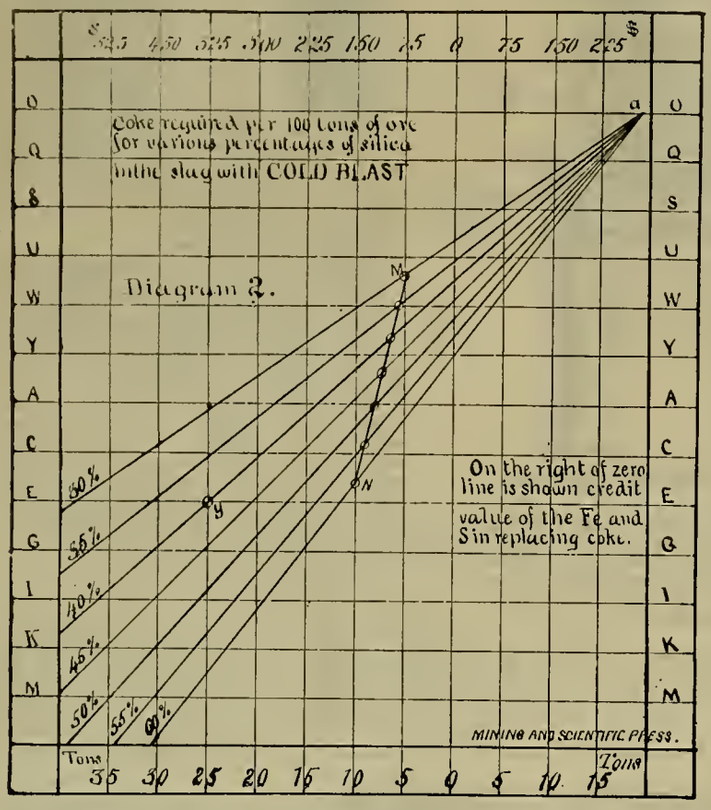
The effect and value of the hot blast is shown in diagrams Nos. 2, 3, 4 and 5. In diagram No. 2 we find that, for example, to make a 40% silica slag (with limestone flux) requires for an ore of type E, using cold blast, twenty-five tons of coke per 100 tons of ore, (marked y on the diagram), while diagram No. 3 shows that with hot blast, under otherwise the same conditions, only 14½ tons are needed, marked x on the diagram). In both of these diagrams the vertical line marked o shows where, under suitable conditions of the type of ore and slag, no coke is required. To the right of the zero line, therefore, the ore will yield of itself a surplus of heat to the extent determined by type of ore and slag. At the point a, where the lines converge, the ore carries no silica, and the limiting credit value is reached.

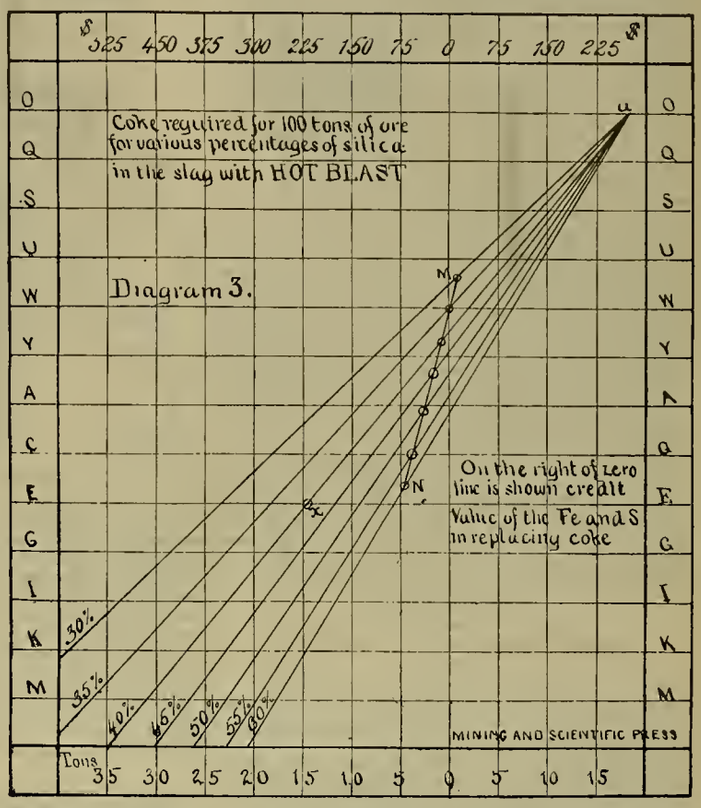
Diagram No. 5 requires no special comment in addition to the description given.

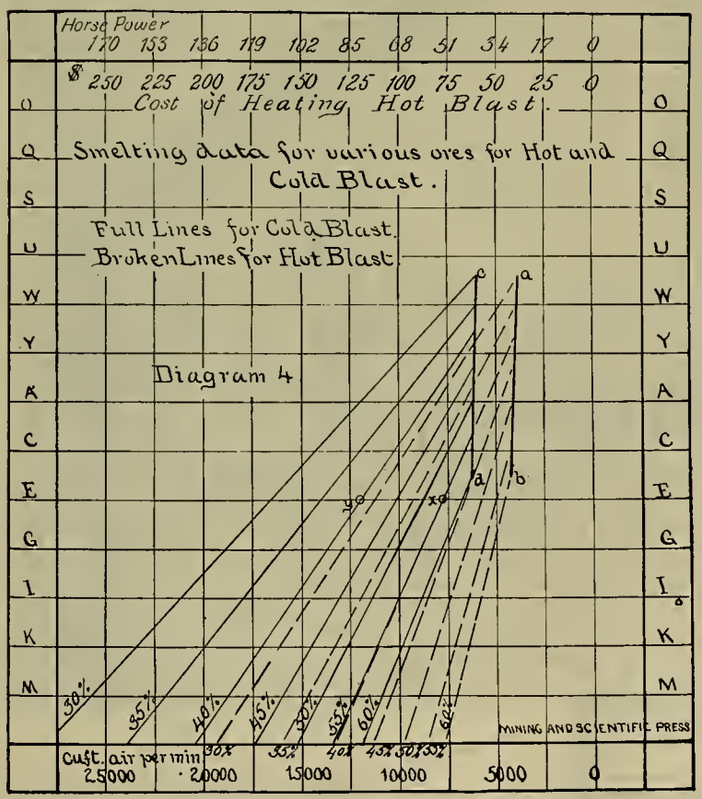
In diagram No. 4 it will be noticed that the lines ab and cd cover types of ore ranging from about V to D. These types are all self-fluxing, in accordance with the type of slag indicated. At about V we get a self-fluxing type for a 30% silica slag, and at about D for a 60% silica slag, and between V and D for intermediate percentages of silica. In all these cases of self-fluxing ores it requires for cold blast about 6000 cubic feet of air per minute and about 40 H. P. to drive the blower, no matter, practically, what type of slag is made, and similarly for hot blast there is uniformly required about 4000 cubic feet of air per minute, measured at atmospheric temperature and pressure, and about 27 H. P. to drive the blower, while the cost of heating the blast will be 40 cents per ton. This would all hold equally good in the case of smelting 100 tons of a mixture of high-grade ore and of sufficiently briquetted concentrates to flux it—100 tons being total amount of both—no matter what per cent of silica the high-grade ore contained, or, within reasonable limits, the quantity used out of the total 100 tons or what type of slag was made.

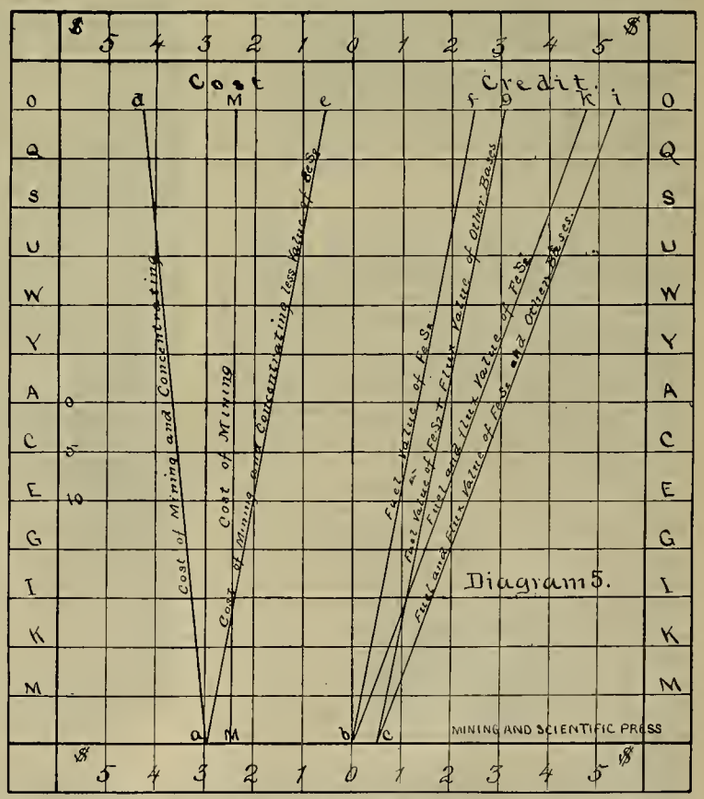
This uniformity would produce a very smooth working furnace, requiring but little attention from the furnace man and less from the metallurgist.

Variations in the amount of coke are shown in diagrams Nos. 2 and 3. With cold blast a 30% silica slag would require 5% of coke (M on diagram No. 2) and a 60% silica slag would require 10% (N on diagram No. 2), while for hot blast the requirements would range (diagram No. 3) from nothing up to 4½%.


Coke required per 100 tons of ore for various percentages of silica in the slag with COLD BLAST
Diagram 2.
On the right of zero line is shown credit value of the Fe and Si in replacing coke.
MINING AND SCIENTIFIC PRESS.
Tons


Coke required for 100 tons of ore for various percentages of silica in the slag with HOT BLAST
Diagram 3.
On the right of zero line is shown credit value of the Fe and Si in replacing coke
MINING AND SCIENTIFIC PRESS
Tons


Horse Power
Cost of Heating Hot Blast.
Smelting data for various ores for Hot and Cold Blast.
Full Lines for Cold Blast.
Broken Lines for Hot Blast
Diagram 4
MINING AND SCIENTIFIC PRESS
Cust. air per min


Cost
Credit.
Cost of Mining and Concentrating
Cost of Mining
Cost of Mining and Concentrating less value of Fe Si
Fuel value of Fe Si
Fuel value of Fe Si & Flux value of other Basis
Fuel and flux value of Fe Si and other Bases
Diagram 5.
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It will be noticed that with limestone as a flux a greater amount of coke is required for a 30% silica slag than for a 60% slag, or just the reverse of the requirements when concentrates form the flux, since the latter bring their own fuel with them in the shape of iron and sulphur.

Diagram No. 4 indicates to a still greater extent the value of hot blast. Take, for example, the same type of ore, E, and of slag (40% Si_2) marked on the diagram x and y. It will be found that to smelt 100 tons of ore daily requires 53 H. P. for the hot blast and 81 H. P. for the cold blast, while the former re-

quires only 7800 cubic feet of air per minute, against 12,000 cubic feet for the latter. The hot blast is supposed to be 1000° F. above the atmosphere, but the effect at any other temperature may be readily had by interpolation. The effect, therefore, of adding a hot blast to a furnace previously operated with a cold blast would be, under the conditions given in the above example, not only to reduce coke cost per ton of ore by more than 40%, hut at the same time to increase the capacity of the furnace by nearly 60%, thus producing other economies as a consequence. It is probahle that the increase in capacity would be more than that stated, since the higher the temperature the more active hecomes the oxygen of the air in its chemical action, and the amount of surplus air would he thereby lessened. Furthermore, smelting would he made easier and a more liquid slag obtained, permitting a higher percentage of silica and a cleaner separation from the matte. The hlast furnace may be compared to a steam hoiler. In the case of the latter some heat is lost by radiation—ahout 4%—a further amount in the waste gases—12% to 20%—while the measure of efficiency is the proportion of the heat ahsorhed hy the water in the boiler to the entire heat generated hy the fuel. We may put this in another way hy stating the efficiency to he the ratio which the actual temperature of the fire bears to the temperature theoretically attainahle hy the combustion of the fuel. To a large degree the temperature of the slag is a measure of the heat efficiency of a furnace. Ore and fluxes in the furnace correspond to the water in a hoiler. The resulting slag and matte may be compared to the steam product of the hoiler, since the object of the furnace is the separation of metallic values from worthless gangue by the difference in specific gravity hetween the molten matte and slag.

Some escape of heat through the jacket and by the waste gases is an unavoidahle loss, and it may he fairly stated that the heat efficiency of a furnace—where no harren flux is used—is the ratio of the quantity of heat carried away by the slag (and matte) to the total quantity attainahle hy the oxidization of the coke, sulphur, iron and other fuels.

(TO BE CONTINUED.)

Unusual Minerals From the Pacific States.

By H. W. TURNER.

Pyromorphite.—This lead phosphate is found ahundantly in the Rocky mountains and elsewhere, hut, so far as known, has not yet been reported from the Pacific slope. G. W. Kimhle of Placerville, Cal., sent some specimens of quartz from a vein in Mosquito gulch, ahout 6 miles northeast of Placerville. This quartz contains a little galena, and a yellow-green mineral supposed by Mr. Kimble to he pyromorphite. The yellow-green mineral was found to be pyromorphite. It occurs as coloring matter in hotryoidal chalcedonic quartz, coating seams and lining cavities; and also as little crystals along seams in the quartz. Mr. Kimble states that the vein occurs in gneissic rock near granodiorite, and that it contains, besides the pyromorphite and galena, a little pyrite and gold.

Monazite.—This phosphate of the cerium metals occurs usually in granites and gneisses, notably in North Carolina and Brazil, hut is known to be common in many parts of the world in sands. Waldemar Lindgren reports monazite in abundance in the Idaho basin, 25 miles NNE. of Boise City. It is usually called "yellow sand." The monazite occurs in small grains, and is presumed to have come from the surrounding granite. Its occurrence here in considerable quantity is of interest, as later it may serve as a source for the rare earths of the cerium group used in the manufacture of the mantles of Welsbach and other similar burners. North Carolina and Brazil now furnish the commercial monazite in sufficient quantity for this purpose.

Apatite.—As is well known, apatite is a very abundant constituent of many granodiorites and other igneous rocks, in the form of minute grains and prisms. The composition of this apatite prohably varies, but to determine its character in a specific instance a gneiss was selected (No. 1743 Sierra Nevada collection) which contains a relatively large amount of this mineral. This gneiss was collected in the canyon of the North Fork of the Mokelumne river east of the mouth of Bear river. It is one of a series of old gneisses possihly Archæan in age. The gneiss is composed chiefly of plagioclase, amphihole, pyroxene, reddish hrown hiotite, quartz, with accessory pyrrhotite, titanite, magnetite, zircon and apatite.

The heavy minerals were separated from the other constituents by means of the Thoulet solution. The magnetite was extracted with a horseshoe magnet, and the amphibole, pyroxene and hiotite with an electro-magnet. The remaining powder contained titanite, zircon and apatite. This was examined chemically hy Dr. W. F. Hillebrand, who states that "the apatite contains a very small amount of chlorine, hut apparently no fluorine whatsoever; at least it could not he detected. Neither does there seem to be hydroxyl replacing fluorine or chlorine." It thus appears in this instance that the apatite is neither a fluor- or a chlor-apatite.

Vivianite ($Fe_3P_2O_8+8H_2O$).—Prof. H. G. Hanks reports this mineral from the Bree ranch in Los Angeles county associated with asphalt. The vivianite is in small enclosed nodules, never larger than a pea and generally smaller.

The Fisher Compressor.

Herewith is illustrated the Fisher compressor, made by S. S. Fisher, 50 So. Clinton St., Chicago, Ill.

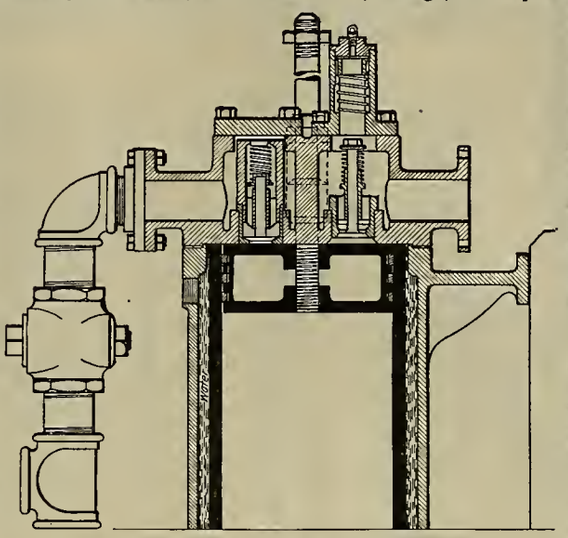


Fig. 2—Sectional Elevation Fisher Air Compressor.

One recently placed in a Racine, Wis., plant has a capacity of 300 cubic feet of free air per minute, 10-inch base, 42-inch stroke. This compressor furnishes air for operating pneumatic tools and also a three-ton pneumatic elevator, and is designed to he attached tandem fashion to a steam engine, or may he operated by belt power.

In attaching the compressor tandem, the back cylinder head of the engine is fitted with a stuffing box to receive the piston rod of the compressor, the head drilled and tapped to attach the two tie rods which hold it in position. The piston rod of the compressor is screwed into the piston of the engine, operating in unison and in a direct line. The receiver pressure is automatically regulated. No air is compressed unless the receiver pressure falls below the point set on the regulator. The capacity of the compressor can he increased or decreased hy a change in the diameter of the inner cylinder and piston; if the hore is 5 inches diameter, the stroke 18 inches, the capacity may he increased by removing the 5-inch cylinder and substituting one that is 10 inches. No change is required in either of the valves, cylinder heads or water jacket. The valve seats can be removed and replaced by new ones. Their construction will he understood from the section elevation (Fig. 2). The compressor is held firmly to the engine hy tie rods, and no foundation is deemed necessary, except enough to carry the weight of the compressor. The air cylinders are cooled hy water circulating through the jacket. Free air can be piped from outside the engine room.

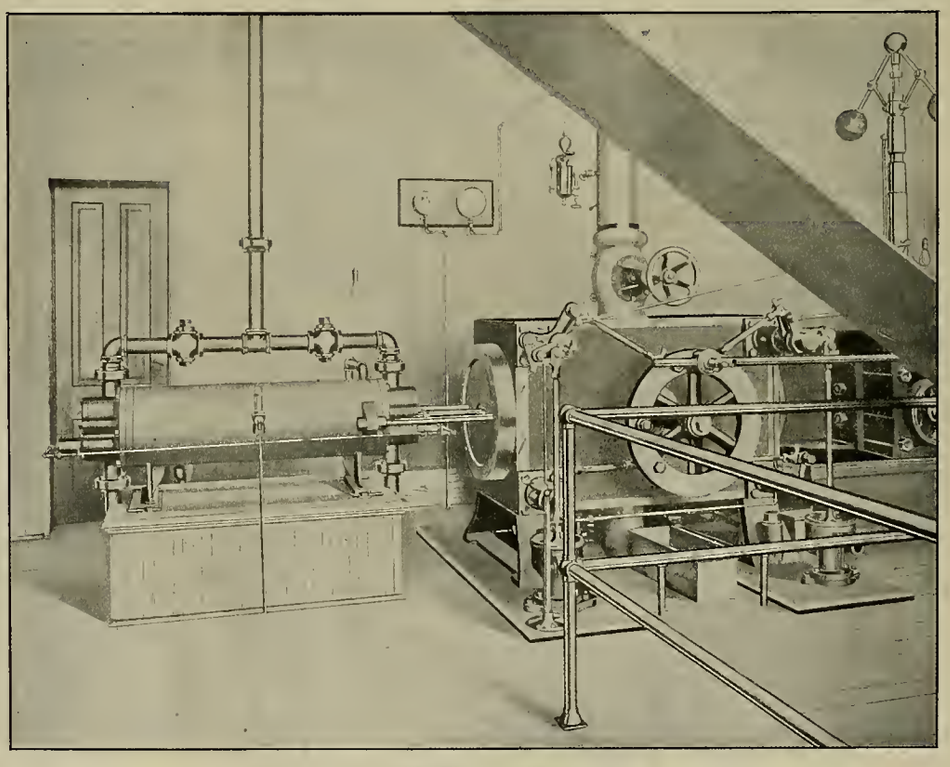


Fig. 1—Fisher Air Compressor.

HERR ENDRUWEIT of Berlin, Germany, has devised an apparatus for producing thin films by electro-deposition. An endless metal band is first coated with potassium sulphide, and, after washing, is passed through a nickel bath of the usual composition. The thin film of nickel obtained in this way is hacked hy copper—by passing through a similar hath containing a copper salt in solution—and by tough paper, hefore being stripped from its support. A strong sheet or roll of paper, faced with hright metallic nickel, can be ohtained in this manner, and the use of this material, after relief stamping and coloring, for wall papers and for advertisement show cards, is said to offer many advantages. The electro-deposited "paper" is also reported to he useful for packing the stuffing boxes of high pressure steam engines.

A FIRST, SECOND AND THIRD PRIZE of 10,000, 5000 and 2000 marks ($2380, $1190 and $476), respectively, for the best "vorspannmaschine," or draft wagon, with alcohol motor, are offered jointly by the Ministries of War and Agriculture, Domains, and Forestry, of Germany, and are designed to hasten and bring out in completed form the several types of spirit motor vehicles for military and general purposes. The specifications are elahorate and precise and provide for a machine which shall weigh, when equipped, supplied and manned in working order, not to exceed 7500 kilograms (15,750 pounds), and the heaviest laden axle shall not carry, when in action, more than 5000 kilograms (11,023 pounds).

A GERMAN colliery reports a recent application of hlast furnace gas to drive a three-phase generator, furnishing current at 1000 volts in the neighhorhood of the hlast furnace, which is transformed up to 10,000 volts and transmitted to the mine, a distance of 4 miles, hy means of three copper wires three-sixteenths of an inch in diameter. At the mine it is transformed down to 1000 volts, and at that pressure is used for driving an endless rope haulage plant, the road over which the rope travels heing another mile in length. The mine is worked hy an adit. The work done is over 4000 ton-miles per day, and the cost is stated to be 1 cent per ton per mile.

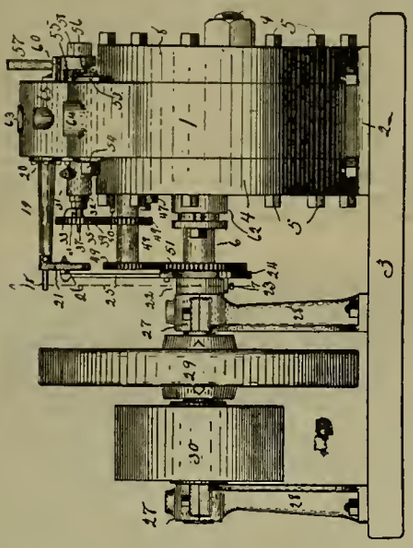
SOME mining promoters need invertehrate experts. The expert's report is important. A London promoter asks an American option holder: "Have you any favorahle expert report?" "No?" Then I fear I can not do anything with your property. We never huy mines; we only buy reports; the mines are thrown in."

Mining and Metallurgical Patents.

Patents Issued May 20, 1902.

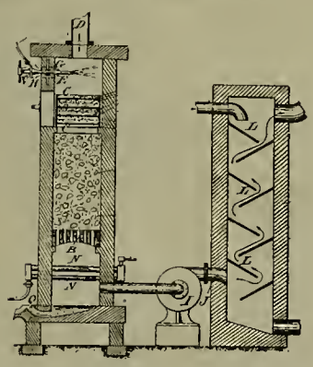
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

ROTARY EXPLOSIVE ENGINE.—No. 700,243; S. S. Rose, Amador City, Cal.



Explosive engine comprising cylinder, rotary piston fixed on shaft, passage 12 communicating with interior of cylinder at opposite sides of piston, exhaust passages 64, passages 13; passages 12, 64 and 13 intersecting at common points, passage 16, supsupply passage 63, for gas, cut-off valve 17 interposed between passages 63 and 16, having crank on stem, explosion chamber 31, hollow rocking valve 14 interposed between passage 16 and inner ends of passage 13 communicating at one end with explosion chamber 31, rocking valves 52 interposed between adjacent ends of passages 12, 13 and 64, occupying points of intersection thereof, eccentric fixed on piston shaft, strap surrounding eccentric adjustably connected to crank on stem of valve 17, lever 57 connected with rocking valves 52, suitable means for igniting explosive mixture in chamber 31.

APPARATUS FOR MAKING SULPHURIC ACID.—No. 700,249; M. G. Sebillot, Paris, France.

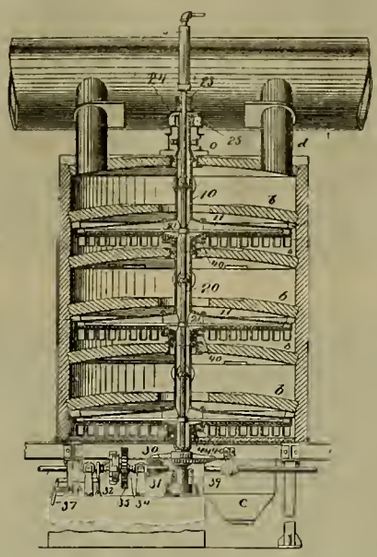


Apparatus for manufacturing concentrated sulphuric acid, comprising vertically arranged casing formed of suitable bricks, perforated partition at hottom within casing, thick layer pumice stone and ashestos supported on partition, series of perforated plates, at top part within casing, layers of spongy platinum on perforated plates, mixing chamher ahove latter, pipe connected to chamher for introduction of sulphurous acid thereto, steam pipe discharging steam into chamber, air admission aperture through which steam pipe extends, means for regulating quantity of steam admitted into chamher, means for regulating quantity of incoming air, means for forcing mixed gases from chamher through various layers contained in casing.

PROCESS OF PRODUCING ALLOYS OR COMPOUNDS OF COPPER AND TITANIUM.—No. 700,244; A. J. Rossi, New York, N. Y.

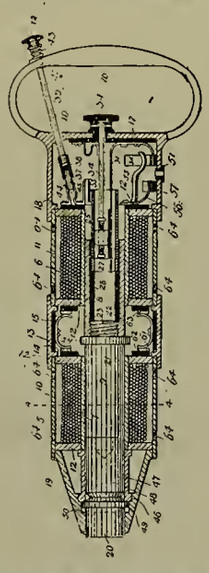
Process of producing alloys of metals assembled in metallic state with metals in oxygenated state, introducing into bath of aluminum and of such metals in metallic state molten together the oxygenated metal, then developing in charge temperature sufficiently high to insure requisite reaction between molten aluminum and oxygen of metals in oxygenated state, leaving metallic residuum of metals to become alloyed with liquefied metal introduced in metallic state into charge other than aluminum, while latter combines with oxygen of oxygenated metals and as alumina slag containing also other impurities of charge is separated from metallic alloy.

ROASTING FURNACE.—No. 700,339; F. Klepetko and W. J. Evans, Great Falls, Mont.



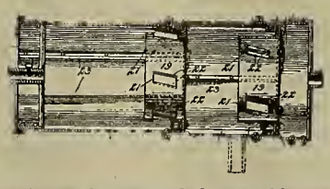
Furnace having plurality of hearths, rotatahle hollow shaft passing through hearths, series of hollow arms radiating from shaft extending into several hearths, inner water feed pipe closed at bottom, located within shaft, rotatahle therewith, series of branches or distrihuting pipes leading from feed pipe communicating at outer ends with interior of hollow arms, for returning water of circulation through hollow shaft to point adjacent to feed end of feed pipe.

APPARATUS FOR ELECTRICALLY OPERATING TOOLS.—No. 700,437; C. E. Moore, Chicago, Ill.



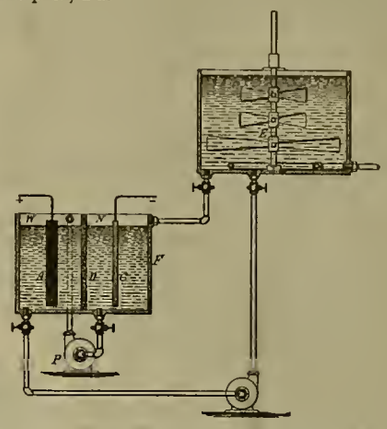
Electrical apparatus for operating tool, comhination with pair of aligned solenoids adapted to he alternately energized, of magnetic core arranged to he reciprocated hy and through solenoids to communicate succession of blows to tool, core heing magnetically insulated from solenoids, independent separated magnetic shields for solenoids to reduce air gap and concentrate lines of force on core.

ORE SEPARATOR.—No. 700,711; F. R. Waters, Salida, Colo.



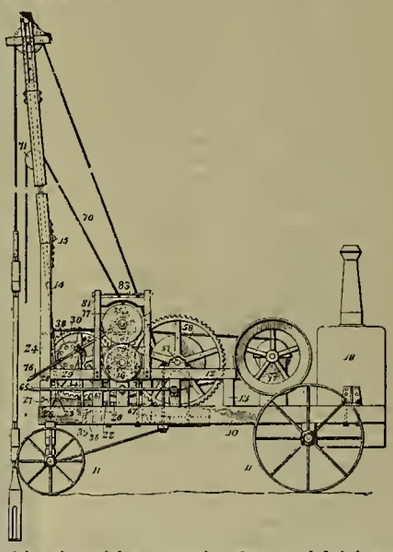
Combination with open-ended rotatahle casing carrying journals at end, of intermediate annular stop flange arranged upon interior of casing, annular retarding collar carried by stop flange spaced from casing, provided with inclined escape openings, inclined wings carried hy collar projecting from hoth faces thereof, stirrer ribs located longitudinally upon inner face of casing projecting into space between collar and casing wall.

PROCESS OF EXTRACTING METALS FROM ORES AND SCRAP CONTAININO SAME.—No. 700,563; S. S. Sadler, Philadelphia, Pa.



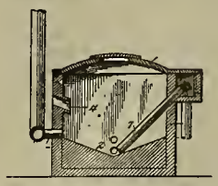
Process of extracting zinc from sulphide ore of same, consisting in dissolving ore in solution containing sodium hypochlorite and sodium hydrate, separating sulphur formed therein, decomposing remaining solution iu cathode compartment of electrolytic cell, simultaneously regenerating, in anode compartment of cell, solution of sodium hydrate left in cathode compartment transferred therefrom to anode compartment after previous operation of same cell.

DRILLING MACHINE.—No. 700,678; R. M. Downie, Beaver Falls, Pa.



Combination with supporting frame of driving shaft and driven shaft, hoth journaled upon frame located in suhstantial parallelism, having reel, means for operatively connecting shafts, including clutch comprising separate members both of which are mounted upon one shaft, one memher heing loosely mounted having geared connection with other, other member arranged to turn with shaft slidable into and out of engagement with first-named member, brake for holding loosely mounted memher against movement, common controlling means connected to hrake, movable clutch memher for successively moving brake into and slidahle clutch memher out of respective engagements and vice versa.

PROCESS OF TREATING ORES.—No. 700,530; A. D. Miller, Mount Peasant, Pa.



Mixing ore with ashestos and a flux, subjecting ore thus treated to action of heat in presence of oxygen furnished both mechauically and by chemical reaction.

CONVEYOR BELT.—No. 700,308; J. M. Dodge, Philadelphia, Pa.

Conveyor belt made of two or more independent endless sections arranged side hy side, ahutting edges of sections hinged together by flexihle hinges so that it will pass around head wheels of conveyor.

The New Portland Mill.

Herewith and on page 291 appear engravings of the new Portland mill from photographs taken while the building was in process of construction. The mill is on a switch of the Colorado Springs & Cripple Creek Short Line, about 1 mile from Colorado Springs, Colo. The four buildings are connected. They comprise the crushing, roasting, chlorination and smelting departments. Each occupies one building. The first two were the subjects of illustration and comment in the issue of the 3rd inst.

The ore is dumped in steel bins of 3000 tons capacity. There are other storage bins for the ore which has been crushed and is ready to be roasted; and still other bins on top of the chlorination department for the ore roasted and ready to be so treated.

The plant is built on comparatively level ground, designed to obviate the necessity of heavy retaining walls and giving a construction enabling each department to be run easily. The mill will have nearly 800 electric lights. The mill, like others treating the Cripple Creek ores now, uses the chlorination process.

The crushing department occupies a building 100x100 feet. An excavation 10 feet deep and 10,000 square feet in area was made first and filled with rock. On this bedding all the foundations for heavy machinery were set in place before the building was erected. There are seven floors. On the bottom floor rests the heavy machinery. The second is a shafting floor, allowing the men to have access to the shafts and pulleys. The third is the bedding floor, on which the crushed ore is mixed and bedded. The fourth is a distributing track floor, from which the cars dump the crushed ore on the bedding floor below. The fifth is the sampling floor, at the bottom of the sampling department. This floor is dustproof, with all joints packed with cloth. The walls of the room are also dustproof. On this floor a large area is covered with steel plates for the quartering of the samples. The sixth and seventh floors are superposed decks for the sampling machinery.

The new feature of the unit system of crushing machinery is conspicuous, as there are two independent sets of crushers and coarse rolls, with their elevators and drying screens. Each set is capable of feeding the whole mill alone, and the two sets can be made to work together or independently, at will. At the bottom of the crushing department are two large crushers, receiving the ore directly from the 3000-ton steel bins. Before reaching the crusher, the ore passes over a grizzly, which separates the rocks of less than 1 inch in diameter and sends them directly by a special elevator to the first set of coarse Cornish rolls. The crusher reduces the rock to the size of 1 inch diameter. It is then taken by an elevator and goes to a set of the coarse rolls. These, as well as the finishing rolls, are placed on a heavy frame, opened below the rolls. With this construction a light can be placed below the rolls when examining them. On page 243 of the issue of the 3rd inst. is an engraving of this department.

From the coarse rolls the ore goes to the sampling room. It is sampled there and can be sent either to the bedding floor or directly to the bins above the dryers. The bedding floor, which is strong enough to support a bed of ore 9 feet thick, is used when the mixing of various kinds of ore is required. From it, as well as directly from the sampling room, the coarsely crushed ore goes to the bins above the dryers. Alongside the floor of the distributing track, on top of the bedding room, is a gallery provided with six dust-collecting fans.

The dryers are two revolving cylinders, made of sectional cast iron. The principle of the drying apparatus is to heat as large a volume as possible and to bring it in contact with the material to be dried. The fireplace of the dryer is especially made with large air channels to heat the air before passing it to the cylinder. Besides, a connection has been made, which allows sending to the dryers the hot air coming out from the roasting furnaces.

From the dryers the ore passes through a set of finer Cornish rolls, 18x42 inches, six in number: the ore crushed by them is sent by an elevator to the sixth floor, where it passes through eighteen hexagonal 40-mesh screens. From these the ore falls into the large ore bins placed below. These ore bins feed the ore to the roasters. On the same floor as the fine screens are twelve rotary dust bag collectors. The ore which is not fine enough to pass through the screens is sent back again to the fine rolls. It passes again through the rolls, the elevators and the screens falling finally into the large bins which are placed just above the level of the top of the roasters, at the limit between the first and second buildings. All the motive power in the mill is furnished by electricity.

The roasting department occupies a building 240x83 feet. There are three cylindrical turret roasting furnaces, connected together underground by a long flue. These furnaces are 60 feet in diameter. The roasting furnace is just above the cooling floor. The ore is fed to the furnace through a hopper and conveyed from the storage bins to the furnace and from the cooling floor to the elevators at the entrance of the chlorination building. Long rabble arms, to which the plows are attached, make the ore pass once through the whole furnace. Then the ore falls down on the cooling floor, making all the work automatic. Another set of arms carries it once around the cooling floor, and the ore falls down into the conveyor, which carries it to the chlorination department. The rabble arms are water-jacketed, thus keeping cool; in the center of the furnace pit the water pours into a basin and is sent back to the pumping station.

The furnaces have each three fireboxes and a flue chamber for outgoing hot air and fumes. The gold losses by volatilization was reduced to a minimum. On page 239 of the issue of the 3rd inst. appears a good illustration of the roaster.

The fireboxes are arranged so that coal or oil can be used as fuel. The temperatures at which roasting is done vary from the cold ore, to about 700° F. at the first firebox, one-third the distance on the hearth, and from this increases to 1100° F. at two-thirds, the finishing heat being between 1500° and 1600° F. The usual time required to pass the ore through the furnace varies from three and a half to five hours, depending on the amount fed in.

The hot air leaving the roasting furnace passes through the long underground flue which connects the three furnaces together. From there it can be sent by a system of doors to the dryers, or allowed to escape directly through a long flue underground building to the smokestack. The smokestack is 193 feet high and self-supporting.

The chlorination building is 194x36 feet, nine stories high, several of these being superposed decks. The ore, which has been cooled and carried by the special mill conveyor, is raised by an elevator to the top of the building, where are storage bins. There are three elevators, one for the ore of each roasting furnace—each elevator feeds two storage bins of 300 tons capacity; the storage capacity of the chlorination department is 2000 tons and occupies the seventh, eighth and nine floors. They empty into hoppers just below. These hoppers weigh automatically the amount of ore put into the barrels. They occupy the fifth and sixth decks. The chlorination barrels are on the fourth floor. There are twelve chlorination revolving barrels of ten tons capacity, distributed in two rows of six barrels each. On page 291 is illustrated the barrel room. The chemicals are raised from the bottom to the fifth and sixth floors. On the sixth floor is the sulphuric acid tank, in which the acid is pumped, and two water tanks. On the floor below the chloride of lime is brought up on an elevator and dumped into little trolleys, which distribute it to each barrel. These barrels have two charging holes, so that the ore can be distributed over the internal length of the barrel and allow of the whole charge being put in without the extra labor of pushing back. When the barrels are full the holes are shut up and the barrels put in motion. After the required time for chlorination, the barrel is stopped with charging hole facing upward and water connections made to a valve on the barrel. At the same time the valve below is opened and the leak runs into the settling tanks. Before going to the settling tanks, the solution passes through several filter boxes. These are wood boxes, lined with lead, in which are three layers of sand—coarse at the bottom, fine in the middle and a layer of gravel on top. From these filter boxes, the solution goes to a group of fourteen settling tanks, at the east end of the building. Then it is pumped into

View of Mill of Portland Mine, Located at

tbe second series of eight intermediate tanks, and the solution is finally pumped from these eight tanks into the seven precipitation tanks. Tbese three sets of settling and precipitation tanks are on the second floor, their top forming the third floor, on wbich are tbe filter boxes.

Below these tanks, on the hottom floor, are four Montejus tanks; two are used for pumping the solution hetween the settling and the intermediate tanks and two others for pumping the solution between the intermediate and the precipitation tanks. Tbe total capacity of the tanks is ahout 300,000 gallons. Tbe solution tanks are made of wood, lead-lined.

When all the leach bas run out of the barrels, the tailings still remain on tbe filters. Tbe charging hole screws are then removed, the harrels are turned upside down, the tailings floated off hy the water into the large bins ahove the concentration department.

Tbe generators for SO^2 and H^2S are on the west side of the barrels floor, just ahove the precipitation tanks, to which they are connected hy a short line of lead pipe and ruhher hose.

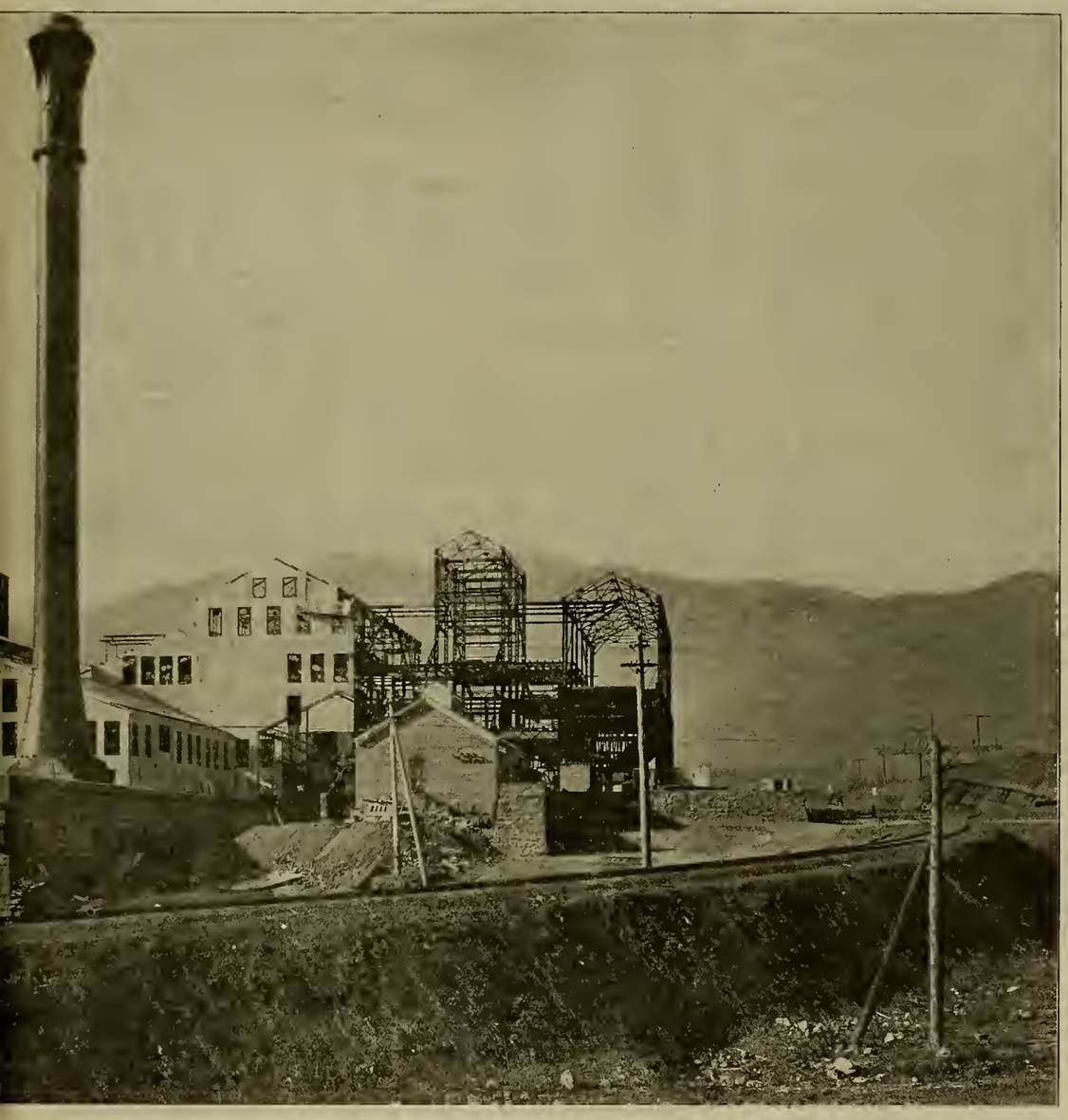
The sulphur dioxide SO^2 is allowed to pass first, and afterwards the hydrogen sulphide H^2S finishes the operation, forming sufficient gold sulphide to collect the finer metallic precipitate brought down hy SO^2. Thirty minutes are sufficient to give satisfactory settling in a tank 6 feet deep. From the filter tanks the solution is made to pass through the filter presses. Wben starting the liquor from the tanks through the presses, it is necessary to release it slowly at first, until the cloths have become firmly hedded and covered with a coating of precipitate, the speed with which the liquor can he run through depending on the condition of the precipitate and the cloths. The filter plates are made of twenty-four chambers, each with a separate outlet, allowing the examination of the filter of each plate and the stopping of the outlet of any chamber in which a hreak may have occurred. From the filter presses the sulphide cake and the cloths are collected and sent to the melting department.

The sulphide cakes and the cloths are placed in the sulphide muffle roasting furnace; the sulphur contained is roasted off and the cloths, if any, reduced to ashes.

The muffle is of cast iron, resting on a hearth of brick. The flames pass over the top of each muffle, tbe roasting being done by the reverberatory action of the fire, no flame or heat passing under the hottom of the muffler. In this way the sulphur is burned off, from the top downward, doing away with necessity of stirring, and with the high heat, which would distort and tend to destroy the muffles, if fired from below, preventing hesides tbe formation of sulphide of iron to any appreciahle extent.

Tbe sulphur gases escape from the muffle through a slot in the hack end into the flue. After roasting and cooling, if the solution has been kept clean in the precipitating tanks, the precipitate will assay from 75% to 80% gold. The gold is then melted into a crucible and a sufficient amount of borax, soda and niter added, so as to form a slag with all the impurities. The gold, nearly pure. is then poured in a mould and finally sent to the United States mint.

The ahove is largely condensed from an article by Etienne A. Ritter in the Daily Mining Record.



orado City, Colo.---Viewed from the East.

WHEN one of our leading sheep men looked at a hunch of amalgam from the Daisy mine worth $3300, he remarked: "Just think of there heing a whole hand of sheep in that pan!" Tbere was a volume in that reflection, for there is no source of revenue so satisfactory as a gold mine. The product is compact and does not cost a fortune for transportation. Moreover, there is never any question ahout the price. There are no huyers hearing the market, and the owner knows he has something the value of which can not be depreciated hy any development.—Idaho Statesman.

PROF. SILLIMAN, at Yale, in discussing the Martinique horror, says: "There are many extinct volcanoes in the western part of the United States, and they are liahle to hreak forth again at any time. There is evidence that they were active at least a few hundred years ago, for there are in existence the stumps of trees that were destroyed at the time of this activity. Tbe volcanic explosions were due to the water getting into the cavities of the earth and coming in contact with the heated rocks."

The Begeer Cyanide Process.

Written for tbe MINING AND SCIENTIFIC PRESS.

Gold and silver can only be dissolved in a solution of cyanide of potassium in the presence of oxygen in accordance with the equation:

$$2Au + 4KCN + O + H_2O = 2AuKCN_2 + 2KOH.$$

It has been proved hy Prof. Cbristie and other autborities that a solution of cyanide out of which all oxygen has heen removed is not capahle of dissolving any gold or silver out of their ores.

Several attempts have been made to supply this oxygen to the solution by means of chemicals, such as potassium permanganate, oxide of harium and sodium peroxide, which had the disadvantage of increasing the cost of extraction and often fouling the solutions.

A pure liquid can ahsorb or dissolve a larger amount of gas than the same liquid mixed witb solid suhstances. A cyanide solution cannot ahsorh a very large amount of oxygen, the cyanide solutions leaving the treatment tanks and the zinc boxes having heen relieved of their oxygen contents for a great part. After having heen hrought to standard strength this cyanide solution is used over again immediately and has, as a rule, very little chance to ahsorb some oxygen.

In the Begeer process the cyanide solution, before heing used in the leaching or agitation vats, is run repeatedly through a centrifugal pump, to whose center is connected an air pipe, and hy means of a system of valves and gauges the solution is saturated with oxygen in a short time, the solution being made to absorh its maximum amount of oxygen. This is done at a cost of about ⅓ H. P. for a 100-ton plant.

In the Dorcas cyanide mill at Florence, Colo., which treats Cripple Creek ores, this was first tried on a large scale and has heen in use since December, 1901. The manager states that where it formerly took thirteen days for the total treatment of a 120-ton tank (including filling and discharging) it now takes about half that time, and that the extraction is higher. It was found in these 120-ton tanks that with the Begeer process after thirty-six hours all the gold was dissolved with the exception of the coarse gold, and this, with the refractory Cripple Creek ores of 1.30 ounce gold per ton, may he considered quick work. The average extraction after thirty-six hours was ahout 87%, while formerly it was after 120 hours only ahout 75.5%. A cyanide solution saturated with oxygen* will contain 30 or more milligrams of oxygen to the like of solution.

When only 1 ton of solution is used for every 3 tons of ore this amount of oxygen contained in the prepared solution is theoretically sufficient for ores containing 8 ounces gold per ton or 4.5 ounces silver per ton. When the cyanide solution is saturated with oxygen it will not lose this oxygen as long as the same conditions of temperature and atmospheric pressure prevail.

Part of the oxygen will escape; when the temperature is raised, when the atmospheric pressure is reduced, and when the air in contact with the solution contains much less oxygen than the atmosphere. As in actual practice, however, the solution will be used immediately after having heen prepared, there is little possibility that some of the oxygen will escape, all the ahsorbed oxygen heing available for the gold and silver reaction.

The amount of dissolved oxygen is in excess over the amount required in the majority of cases in actual practice, hut it is, of course, always an advantage to have as large an excess as possihle, to get the best results.

*The figures relating to results obtained by the Dorcas mill were given by the Dorcas management.

AT Houghton, Mich., the Calumet & Hecla management has under consideration plans for the erection of a plant for the treatment of the slimes from the stamp mills. The treatment is known as the "automatic flange system." Experiments of the method have heen conducted under the direction of C. C. Woodworth of San Francisco, Cal. It is expected that a great saving will he made through its adoption.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

Lake Lebarge broke up May 24 and navigation is open. Boats wintering at the mouth of Thirty Mile and foot of Lake Lebarge arrived in Dawson May 23.

The greatest nugget ever found north of Cariboo was unearthed on J. B. Brooks' hillside claim, between King Solomon's hill and Monte Christo gulch, Bonanza creek, weighing 320 ounces, valued at $4000.

In mining in diving suits at Bluff City holes are cut in the ice a short distance from shore and a deep scoop or shovel operated by a hand windlass; a man in a diving suit does the mining. The water is 9 feet deep. Two pans of sand scooped up are reported to have aggregated $48.

ARIZONA.

COCHISE COUNTY.

In the Eureka M. & M. Co. mine at Hartford, near Bisbee, a large body of high-grade ore was struck in shaft No. 5. The milling ore averages $30 per ton.

At Lowell and vicinity the railroad grading is nearly completed. The shaft in the Lowell mine is 1000 feet deep.

GRAHAM COUNTY.

Supt. J. Molder of the Home Copper Co., near Morenci, says a crosscut has been run on the Buzzard's Shadow, cutting a ledge 40 feet wide, all of which pans well in gold and shows sulphides of silver across the vein.

MOJAVE COUNTY.

J. A. Jordan, manager, has a property in which the values show native and horn silver at the junction of three porphyry dikes. The company is sinking a double-compartment working shaft at the junction of these dikes.

Three French capitalists have gone with O. P. Posey to examine the Gold Road mines, near Kingman. If the investigation results satisfactorily a deal will be closed.

The New Comstock M. Co. has shipped to the Arizona Central Bank bullion worth $500 from a partial clean-up of a week's run of the Sheeptrail mill.

K. St. Charles has a large ore body in the Midnight lode, at Chloride.

At the Cyclopic mine, Gold Basin, the first run of the cyanide plant was satisfactory.

The Arizona & Minnesota G. M. Co. has men employed taking ore from the Eldorado mine, Gold Basin, and hauling it to the mill. The O. K mill will begin crushing soon. J. P. Jacobson is Supt.

PIMA COUNTY.

The Troy miners have voted that it shall be a prohibition camp and Manager C. H. Cutting has raised the wages to $3.50 per day, no Sunday work.

It is proposed to remove and rebuild the stamp mill at the University of Arizona, to do custom milling for the small mines near Tucson, the plant to consist of two 5-stamp batteries and a small cyanide plant capable of making runs of five-ton lots, the mill to be run by the students.

A flow of artesian water was struck 15 feet below the surface at Tucson; 50,000 gallons of water are daily flowing from the well.

PINAL COUNTY.

C. Udall is working 350,000 tons of tailings at Mammoth for lead.

SANTA CRUZ COUNTY.

The new 100-ton concentrator at Washington camp is in operation.

The Cerro Prieto M. Co.'s 20-stamp mill is running daily on the company's mine in Magdalena district.

YAVAPAI COUNTY.

The Crown King road is graded 17 miles from Mayer; a bridge is being put in 3 miles from Mayer; there will be a 300-foot tunnel at the far end; there are five camps on the line and about 600 men in all are employed.

The Cumberland mine, near Pine Flat, will build a quartz mill to handle $5 ore.

A Cameron pump has been shipped to the Home Rule mine, on Groom creek.

Ore from the Fisher and Noble claims, Copper Basin district, gave an assay value of $13.50 per ton gold and 9% copper.

Supt. Kiley of the Oro M. Co. will have the 60-stamp mill in operation by June 1.

The Agua Fria district ore body is 3 feet wide.

Supt. Blauvelt is working forty-five men at the Cash mine and mill near Prescott. He has shipped the first carload of concentrates from this property.

Regarding the strike in the Cliff mine, Verde district, near Jerome, the ore runs 8% copper, with values in gold and silver.

The shaft at the Model mine, near Kirkland valley, is 300 feet deep, with drifts extending 100 feet each way. The ore body is 4 feet wide, and, it is stated, runs as high as $150 gold per ton. President F. Jager of the Model M. Co. has bought the Alta, Batchelor and Wolftone claims.

F. Jager of Chicago has bought the Bachelor, Alta and Wolftone gold mines for $150,000 for the Model G. M. Co.

A strike is reported in the Hudson mining group on Lynx creek.

The Dos Oris mine, 10 miles from Prescott, has been sold for $25,000.

YUMA COUNTY.

Work will be begun and the necessary machinery purchased to work the Darling and Bradshaw mines in the Quartzite mining district.

CALIFORNIA.

AMADOR COUNTY.

On the 800-foot level of the Bunker mine the drift has broken into ore estimated to be worth $10 a ton.

Twenty additional stamps have been started in the Central Eureka. The rock in sight is sufficient to keep forty stamps in constant operation.

The dumps of the Empire and Pacific mines at Plymouth have been leased by W. E. Dargie to Plymouth miners.

In the Montezuma mine at Nashville a ledge at the 300-foot level runs $64 to the ton.

Hayward & Lane have men prospecting the Ballard & Martin tract, near Plymouth.

At the Kennedy mine, Jackson, a new hoist will be put over the East shaft. A third boiler has been put in there and room for two more made. A second air compressor doubles the plant and makes everything ready for rapid mining when the ledge is reached from the 2400 and 2500-foot levels of the East shaft. These crosscuts have reached 500 feet from the shaft. A large mill is to be erected this year near the East shaft, and when completed the work of the mine will be done through the one shaft.

The Kretcher mine has been bonded to the Rhetta Con. M. Co. for $10,000, on which $2000 is paid.——The Edinburgh G. M. Co.'s tunnel is now underneath the shaft and an upraise has been started to make connection. Drifting continues along the ledge.——The Amador-Phœnix M. Co. is working on the 100-foot level ——The Horn mine tunnel is in 200 feet and within 100 feet of the ledge, which will be tapped 100 feet below water level. The vein is small but high grade, samples assaying as high as $300 per ton.——R. L. Chase is building the 20-stamp mill at the Mitchell mine, near Pine Grove.——At the Fremont mine, near Drytown, concrete supports for the new gallows-frame have been built and work is continued at the 750-foot level.——At the Gover mine foundations for the new air compressor is being built.——A shaft is being sunk on Indian creek, near Plymouth, and pumps started.——At the Bay State a bar of gold weighing twenty pounds is the result of ten stamps running twelve hours a day for two weeks.

Power is being supplied from the new plant at Electra to consumers in Amador and Calaveras counties.

The Lincoln shaft is 2036 feet deep.

Power drills have been introduced in the Del Monte, near Railroad Flat.

BUTTE COUNTY.

The Cherokee mine is being operated under a lease.

On the Braselton place, near Oroville, a tract of eighty acres has been leased to R. S. Grant. A hydraulic elevator will be built. Pipe for the work is being hauled.

CALAVERAS COUNTY.

The Stanislaus Water & Power Co. is incorporated in San Francisco to use water from the main or middle fork of the Stanislaus river. A water and power system will be constructed to divert the water at a point about 25 miles from Sonora from the intake carried by flume and ditch, capacity 15,000 inches, about 16 miles long, along the south side of the canyon to a point 6 miles east of Murphys, where a vertical fall of 1500 feet is available. Seven thousand inches utilized there at an electric power plant, generated 21,000 H. P., 6000 inches carried across the canyon through an inverted siphon 9000 feet long to take this amount of water across into Calaveras county for use in hydraulicing on the San Domingo mine principally, and other properties along the Central Hill and Cataract channels in the vicinity of Murphys, Douglas Flat, Vallecito and Angels.

G. Batten of Murphys has sold his interest in water rights on Stanislaus river to Beach Thompson of the Stanislaus Water & Power Co., which has been organized by Beach Thompson of the San Domingo G. M. Co., for $25,000.

The mill on the old Orchard mine in San Andreas is being moved to the Montana mine, Esperanza creek.

The Reliance, near West Point, has started up and the 4-stamp mill is running.

F. F. Carnduff, of Milton, and associates, are dredging for gold in the Calaveras river in the vicinity of Jenny Lind.

Owing to a scarcity of men, the Sierra branch railroad to Angels Camp may not be completed to Angels till September.

The Gluffra mine, near Mokelumne Hill, is running steadily and the plates show good returns; ten stamps are dropping.

The water in the Lamphear has been lowered over 100 feet.——Work continues at the Kiser-Maguire mine on French Hill, and results of exploration are encouraging.——Operations have begun at the Lancell mine at Buckeye. When ditches are dug and flumes and pipe laid, hydraulicking will commence.——J. D. Olson of San Francisco has bought the Calaveras group of eleven claims, between Murphys and Sheep Ranch. Work on the mines has begun. This property will be equipped with mining plant.

At the Gwin mine high-grade rock has been opened up. The strike was made at the 1750-foot level.

At the Dorroh mine at Central Hill a blind ledge was struck in the slate formation which contains rock running. it is said, several hundred dollars to the ton.

The Southern Pacific Co. will build an extension of the Railroad from Valley Springs to the Gwin mine.

EL DORADO COUNTY.

J. H. Zimmerman has bonded his gravel property at Pacific for $50,000.

The Langrage & Noyes stamp mill at Poverty Point has started up.——At the Atlantic, at Placerville, a fine body of ore has been struck in cross-cutting, free milling and sulphurets.——R. Smith is milling ore from the Ohio mine that is said to run $50 per ton.

A new mill will be erected at the Zentgraf mine to replace that destroyed by fire.

A. Harpending will sink the main shaft at the Union to the 2000 level.

P. Stingle, Supt. Golden Queen mine, Kelsey district, reports the tunnel still in diorite; it is now in 200 feet.

A large boiler and two sections of smokestack have arrived at Placerville for the Eureka slate quarry.

The California-Bangor slate quarry have commenced operations and will establish a slate yard below the proposed box factory site in Placerville.

INYO COUNTY.

The Golden Argus and Mineral Ranch M. Co.'s, in the Panamint range, will put tramways on their respective claims.

At the bottom of the main shaft at the Reward, near Bishop, a 14-foot ledge of high-grade ore has been developed. The ore carries coarse gold.

KERN COUNTY.

The old Keyes mine is being worked, twenty men are employed. Milling ore said to run $100 per ton is being milled in the 5-stamp Hooper mill.

From the Mammoth, near Keyesville, ore running $25 to $100 per ton is being taken out. The Pennsylvania is milling ore that goes $125.

On the placer claims in Mammoth and Keyes gulches a new water way 75 inches capacity has been built and the ground below is being worked, miners taking out $10 to $12 a day.

C. Teagle will put in a small cyanide plant at Searles to treat the ore from the Gold Bug, which mills 50% by amalgamation.

The Randsburg Miner reports in the Gold Coin mine at a depth of 75 feet a body of ore 7 feet wide and said to run $12 to the ton.

The Phœnix mill at Randsburg is running on Val Verde ore.——Ricker, Reeves & Lloyd have a 200-foot lease on south end Kinyon claim.——Carson & Wickard had a $650 cleanup from fifteen tons of ore, a month's work on the Sydney Annex.——The last run of Stanford ore at the Red Dog mill yielded a brick valued at $2600. ——From a milling of twenty-five tons from the Pearl wedge in the Stringer mine, Randsburg, the cleanup was $2400. ——Connection has been made between the Kinyon and Wedge claims at the 155-foot level. The hoisting is done through the Wedge shaft.——The Santa Paula Co.'s mill in Salt canyon is running on good ore hauled from the mine.

LAKE COUNTY.

Quicksilver is found on the east side at the Abbott mine, at the Sulphur banks on Clear lake and in the belt southwest of Middletown. Sulphur was mined extensively at Sulphur banks until it was found that underlying and in part mingled with it was cinnabar.

MARIPOSA COUNTY.

The Organite mine at Hornitos is in operation and have installed air drills. R. W. Dodds is Supt.

MONO COUNTY.

Supt. Pierce of the Crystal Lake M. Co. of Lundy reports 1000 tons of concentrates on hand, but will not be able to move half of it this year. The mines are 12,000 feet altitude.

NEVADA COUNTY.

The Empire mine has received a large air compressor.

The new stamp mill on the Ironclad mine below Rough and Ready has pounded up 250 tons ore from the drifts at a depth of 180 feet, under the superintendency of G. C. Hay.

The Union hears that the Allison Ranch M. Co. will soon commence the erection of a 20-stamp mill and a new hoist.

A hundred men are employed on the power plant at Alta and in fixing ditches and reservoirs preparatory to putting the system into operation.

In the Gold Hill or Nevada City mine the main or southern shaft is down 1000 feet; the northern shaft, where work is now being done, is down over 600 feet. The ore shoots range from 2 to 3 feet in width. The quartz is sulphureted and shows free gold, the sulphurets worth from $100 to $400 per ton, the quartz yielding from $8 to $40 per ton. A tunnel, nearly a mile long and emptying into Deer creek, drains the upper shaft to a depth of 500 feet. Over $600,000 has been produced by the Nevada City.

PLACER COUNTY.

W. F. Englebright, in charge of the construction work of the Central California Electric Co., says one hundred men are employed on the power plant at Alta and in fixing up ditches and reservoirs for the starting up of the system in September. Surveyors are mapping routes for pole lines, one to Auburn and the other to Grass Valley and Nevada City.

E. C. Gaylord is cleaning out the lower tunnel in the Haskell mine, near Auburn, and retimbering. A mill will be erected in the fall.——The Baltimore and Hope, at Forest Hill, has been bonded to Mr. Westhall.——At the Sellier mine the tunnel is in 1600 feet. H. T. Power is Supt. at Forest Hill.——The Boston Co. is operating a quartz mill on Dewey and Mayflower ground.

SACRAMENTO COUNTY.

The new gravel scouring mill at the Gray-Wing mine near Folsom is said to be a success. The gravel is left entirely clean after passing through the machine and the soft bedrock and clay are pulverized.

SAN BERNARDINO COUNTY.

The California Eastern railroad from Blake to Manvel, from Manvel, 14 milles, is sold to the Santa Fe. The road passes the mills at Vanderbilt and comes to an abrupt ending in the Ivanpah valley, 12 miles from the old Ivanpah mine.

SAN DIEGO COUNTY.

It is expected that the 200 men employed at the Picacho mines, near the Colorado river, will be doubled by next October. The railroad, 6 miles long from the mines to the Colorado river, is finished.

F. Salmons has sold a half interest in his lepidolite mines at Pala to Gay & Blakeley of Redlands for $10,000.

SHASTA COUNTY.

G. Miller's lighted cigarette blew up the Deltite powder works at Delta on the 22d, the explosion killing his wife and child and wrecking the works. He is real sorry about it.

At the Mt. Shasta the mill is running on waste accumulated before building the mill.

Miller & Spitzfadden have bonded the Lexington quartz mine in Shasta mining district for $2500.

The Mountain Copper Co., organized in London, England, in 1896, owning and operating the Iron Mountain copper mine and Keswick smelting plant, reorganized under the same name on the 10th inst. in London. All the land, properties, works, plants, tenements and machinery of the company in California and New Jersey, where it owns a refining plant, are transferred from the old company to the new. The consideration given is a nominal one; the instrument carries a value of $850 in revenue stamps, indicating a valuation of $1,700,000 on the property transferred. The reorganization provides for a capital of $1,250,000 in ordinary shares, par value $5 each, and $3,750,000 debentures, bearing 6% interest, or $15 each, in place of $6,250,000 in $25 shares, as provided for in the old corporation. The debentures are to be paid off gradually, eventually reducing the capital to $1,250,000. The present reserve fund of the company is $2,500,000, or 40% of the capital stock.

The Mt. Shasta Gold Mines Corporation will install power drills at the Mt. Shasta mine on Clear creek, near Shasta.

SIERRA COUNTY.

The Alta mine at Alleghany is sold to the Oriental G. M. Co.

G. Simmers has begun work at the Hilda

mine, near Downieville. There are several men employed.

A strike is reported in tho Golden Era, near Sierra City.

SISKIYOU COUNTY.

The Music property will erect a small mill. A strong ledge has been developed and stoping is under way.

The Mountain Lion, China gulch, is under bond to G. Gerken, nperatiug for Mr. Covode of New York. The ledge is uncovered for 200 feet and the ledge matter assays $10.

The Huntington mill at the Sheba mine on Patterson creok, being hauled to Humbug creek, will be erected on the O. N. Lawson mine.

B. A. Cardwell, Etna, has been investigating the coal deposits in the eastern part of the county along Willow creek. He is reported to have found three ledges of good coal 3 feet in width.

A strike is reported at the Enterprise mine at head of Deadwood.

Manager Trowbridge of the Maybell mine, near Scott Bar, has leased the stamp mill on the Columbia mine and will crush some of the Maybeli ore.

H. B. Kelly will start up the stamp mill recently erected on the Clifton mine on Dutch Gulch, near Gottville, July 1st. The ledge has been crosscut 35 feet and no hanging wall in sight. The vein consists of serpentine and quartz.

The dredger at Callahans has resumed work.——The Huntington mill at the Sheba, on Patterson creek, is being hauled to Humbug for the Lawson mine.—— H. Mattern of Cottonwood is putting up a quartz mill near Henley.

Humbug is looking better than ever hefore. At the Punch creek mine the shaft is down 350 feet, showing a 5-foot ledge of ore. McCook's mill is running night and day; the water supply will be sufficient this summer to keep the mill going.

TUOLUMNE COUNTY.

At Columbia the 10-stamp mill at the Riverside and the 15-stamp mill at the Keltz are in operation.

The Shoenberg M. & M. Co. has bought the Nichol mine, near Groveland. M. C. Dale will take charge and begin work at once. A vertical shaft will be sunk and a whim is now in use. A new hoist will shortly be placed in position.

At the Republican, near Sonora, a 10-stamp addition will be made to the mill and a chlorination plant built.

E. C. Holmes has bonded the Hard Tack group on Hunter creek, near Carters, for $40,000, payable within 2 years, $10,000 to be paid July 1st, the purchaser to pay 25% of the gross proceeds.

The Never Sweat mine, near Big Oak Flat, has closed down.

The Bell mine at Tuttletown is honded to W. J. Rule and G. Buell of Stockton.

H. Willey of Santa Cruz has sold the Olsen mine, near La Grange, to the Oak Hill M. Co. for $10.000.

The Mack Con. G. M. Co. have bought the Wooten mine adjoining the Mack, near Big Oak Flat, for $3500.

Thirty men are employed at the Draper mine, H. C. Converse, Supt.

The Black Oak, near Soulsbyville, will put in a new pump.

The Rawhide G. M. Co. has brought suit in the United States Circuit Court against the Tuolumne Water Co. and the Tuolumne County Electric Power and Light Co. to recover the plant owned and operated by the defendant corporations. The property is valued at $150.000. The complaint alleges that in 1898, Nevils, Martin & Ballard, then proprietors of the Rawhide mine, sold to the water company the Rawhide electric light plant for $150-000, and agreed with the defendants that payment should be made by furnishing power and light to the Rawhide and App mines. It was further stipulated that the water company should pay 40% of all receipts derived from outside sources to the Rawhide M. Co. The complaint alleges that this has not been done.

COLORADO.

CLEAR CREEK COUNTY.

J. G. Roberts, manager Jackson Concentrating Works, is running his mill day and night and has plenty of ore on hand. This mill has not been shut down in six years on account of scarcity of ore.

The new power plant at the Kelley tunnel will soon be in operation.

GILPIN COUNTY.

(Special Correspondence).—Many changes are being made in the Boston & Denver Con. M. & M. Co.'s mill at Black Hawk, putting in more hoilers, overhauling and changing their concentrating tables, and in about two weeks will have forty more stamps in operation. They are now operating forty stamps. This same company will commence in about one week to sink a three-compartment shaft about 500 feet on the Cook. O. B. Thompson is manager of the company.

D. H. Allen, general manager of the Miners' Ore Sampling Co. at Black Hawk, expects to have his sampler in operatinn June 15th. When completed he will be able to handle 100 tnns of ore per day.

The Saratoga mine in Russell gulch, F. R. Carpenter of Denver general manager, is running with about 110 men each day. This property was operated for a number of years at a loss, but is now on a paying basis. The ore is being sent to the Golden smelter at Golden for treatment. New machinery has been installed at the mine to the extent of several thousand dollars in the past few months. Preparations are being made to sink shaft from 910 to the 1100-foot level, making one lift of 200 feet. They will install a double deck cage. The Newhouse tunnel is about 1000 feet from the Saratoga vein. It is understood the tunnel work has stopped temporarily, but will commence again if negotiations under way with Saratoga company are successful; it will cut the vein on the Saratoga. The ore in the Saratoga is heavy sulphide, carrying a small percentage of coppe-.

W. J. Lewis, manager Hidden Treasure mill at Black Hawk, has all the custom work he can take care of. He is operating seventy-five stamps day and night.

Black Hawk, May 23.

GRAND COUNTY.

(Special Correspondence).—J. E. Kilduff, manager Louraine G. M. & M. Co. of Dexter, is doing placer work on Willow creek and saving about 30 cents per yard. As soon as the Moffat railroad goes through to Salt Lake City, Utah, this section will advance. They are now about 60 miles from the railroad, but the Moffat road will pass through this country, making it convenient to reach.

Dexter, May 24.

GUNNISON COUNTY.

H. C. Schimp, secretary Colorado Mines Con. Co. of Colorado Springs, will place a 10-stamp mill on the company's property in the Gunnison country. The mill will have 1000-pound stamps.

HINSDALE COUNTY.

At Lake City Supt. Nicholson of the Ute mine lately ran a crosscut from the main tunnel to the vein 500 feet back of where the vein was cut a year ago, tapping a body of ore 2 feet wide, assaying besides gold and silver, 45% lead.

LAKE COUNTY.

The Eclipse shaft of the Waswado Co. is down 1100 feet. Two drifts are being run. This property is on Bald mountain. ——The Home Extension has elected officers and subscribed $62,000 to pay off indebtedness and resume work June 1.—— The work of sinking has been resumed on No. 1 shaft of the Resurrection.——The Fortuna, in Iowa gulch, will start up about June 1. The property has produced $60,000 in gold.

The New Jersey G. & C. R. Co has leased the plant of the Harrison R. Co The company will handle the old dump. The dump contains a large amount of slag. The company will put up a pyritic smelter to treat sulphide ores.——Two hundred and fifty tons per day is the output of the Wolftone.——The Small Hopes M. Co. has arranged with the Rialto people and they will have charge of the pumping and prospecting. The Rialto has until the last part of the month to raise the funds and if it is done the Rialto Co. will proceed as before.——The Midas is turning out 200 tons daily.

At Leadville the Home M. Co. is reported abandoning work. There is plenty of ore in sight, but the low price of silver does not pay. The Midas may yet enter the property and operate the pump to drain its own ground.

The time for the Rialto M. Co. to redeem the property passed on the 17th, and the mine is now in the hands of S. W. Mudd. It is locally reported that it will require another $100,000 to put the property on a paying hasis. The Rialto people spent $225,000.

The Pelton lease on Breece hill has been driven out of the lower workings hy the flow of water and work was resumed a few feet from the surface, just below the wash, where several streaks of ore was found running from .62 to 1 ounce in gold.

Properties in Lake Park creek have resumed work. The Birdy has a 2-foot streak that runs 147 ounces silver and .93 ounces gold. The vein on the Birdy has been cut hy a crosscut tunnel 400 feet. The formation is granite traversed by a porphyry dike; the values lie in a talc seam alongside of the latter.

News-Dispatch: The future of Leadville is gradually resolving itself into one of two propositions, viz., that the low-grade ore must he treated hy a mill or cyanide process. The former seems the best adapted to the situation and several mines have already erected mills. The A. M. W. mill is said to be earning $8000 a month milling a lead-zinc product that could not be handled until it was concentrated. The Humholt mine has started a mill proposition that seems to be giving fair satisfaction. It is not saving all the ore, but it is making a fine lead product. Other mines are arranging to handle their low-grade ores by concentrating.

LA PLATA COUNTY.

At Durango the coal miners have rejected the operators' proposition tn return to work at $3 a day, or at the tonnage scale, and agreed to stand by the new scale adopted two months ago. It is now a question of endurance.

OURAY COUNTY.

At Ouray the Imogene Basin Co. is preparing for an active season. The property is adjaceut to the Camp Bird.

The ore of the reported strike in the Portland is a black manganese, assays showing 247 ounces silver, 1½ ounces gold and 7% copper.

A strike is reported in the Morning Star, in the Sneffels district. The tunnel has penetrated Stony mountain 400 feet. The ore is 16 inches in width in the breast and is widening. The leasers are running the main drift with three double-hand shifts, making 4½ feet per day.

The Blaine mine at Ouray has resumed. A tunnel is being driven tn cut the vein. The shaft on the Silver Link is down 400 feet. A strike has been made in the Portland.

PARK COUNTY.

Schlessinger Bros. of the Last Chance mine, near Fairplay, will incorporate the Cerusite M. & M. Co. The mine is opened by shafts and tunnels and about 10,000 tons of ore developed. The ores are lead-iron sulphide, carrying gold, silver and lead, and is a milling ore. A concentrating mill will be built. The postoffice at the mine is Doran.

SAN JUAN COUNTY.

Near Silverton men are running the Chattanooga tunnel. This will cut the Montana vein 2012 feet from the portal.

E. C. Condit, Supt. Sioux M. Co. at Silverton, will purchase new machinery.

J. B. Warner, manager the Ledge M. & M. Co. of Silverton, will huild a 200-ton concentrating mill; there will be Chili mills, crushers, rolls and twenty concentrators in the mill.

SAN MIGUEL COUNTY.

Two Camp Bird mining deeds were placed on record last week, one deeding seventy-nine claims to the Camp Bird M. Co. of Denver, consideration $75,000. The other conveyed thirty-seven claims to the Camp Bird, Ltd., of London, consideration $3,125,000; revenue stamps thereon amounted to $1561.25. The Examiner says: "This does not indicate the full purchase price of the properties, as the final transfer to the English syndicate will take place upon completion of the title, which will be after patents have heen secured."

Near Telluride, the Turkey Creek will have a new transformer house.

The Alta Mines Co. will install a new crusher.

The Peck cyanide plant, near the Smuggler mill, Pandora, has begun operations.

The Ophir Consolidated Mines Co. will huild a new mill at the Silver Bell and Butler mines.

At the Tom Boy property a new plant is being built. The new boarding-house will accommodate 300 men.

The new county road from Telluride to the Tom Boy and Smuggler-Union mines in Savage and Marshall basins will not be completed for a year.

The report of the treasurer of the Argentum-Juniata shows that during the last three months there were produced 3481 tons of ore containing 206,538 ounces of silver and 86,686 pounds of lead, the gross value of the silver being $107,915 54 and the lead $1886.88, making the total production of the mine $109,802 42. The railroad freight was $15,632 12, the smelter charges $8820.77. making the net proceeds on ore shipped $60,500.86. The mine and mill operating expenses, less shipping and selling expenses and the payment made to lessees, were $43,226 63, leaving net profits at mine over operating expenses of $17,-274 23. This is reduced about $3000 by local and other expenses.

A canvas tahle plant will he erected at the Alta, at Telluride, to treat the tailings. The slimes carry: Gold, 1.62 ounce; silver, 42 9 ounces, and 24 16% lead. The plant will be in operation in July, and will mill $7 ore. The concentrates run 3% copper, one-half ounce gold, thirty-nine ounces silver, 12% lead, 26% iron and 12% silica, the concentration being 5½ to 1.

SUMMIT COUNTY.

At the Robinson Con. M. & M. Co.'s plant one matting furnace will be blown in June 1st. It has a capacity of 100 tons per day. The mines produce a heavy iron sulphide and a highly siliceous ore, carrying gold values. F. W. Bulkley is manager, C. H. Doolittle smelter Supt.

McDougall Bros. are driving a tunnel in the Tylor at Swandyke, working on lease and bond. Their 10-stamp mill is at work. They are also working a concentrating plant.

The Breckenridge Deep M. Co., C. A. Finding general manager, operates near Breckenridge and is preparing to put down the deepest shaft in the county, with the expectation of encountering the Leadville contact.

TELLER COUNTY.

The hills north of Cripple Creek and to the west are being prospected. Carbonate, Rhyolite, Mineral and Copper mountains are reported alive with lessees and prospectors.

The Granite mine on Battle mountain is hoisting thirty tons of ore per day that averages $50 in gold. The hoist is 24x36, first motion, 300 H. P. steam plant of machinery capable of hoisting 300 tons a day. The ore is being taken from the fifth, sixth, ninth and tenth levels. The vein varies in width from 4 to 20 feet.

On the Coriolanus mine, near Victor, a body of ore 3 feet wide has been opened that ships 2 ounces to the ton. The vein carries a high-grade streak that runs 10 ounces to the ton.

Cutting a station at 1000 feet in the Findley shaft has been started. In the 900 level the ore body varies in width 8 inches to 3 feet. Twenty-five tons of $33 ore are being produced daily; sixty men are employed.

Ten tons of ore are produced daily from the McFarland and Owenby lease on the Pharmacist on Bull hill. The mineral is mined in the 600-foot level.

Hull City mine is cutting a station at 1050 feet. They have extended a drift to the side line of the Findley claim.

The Gold Hill, Cripple Creek, output for May will go above 50,000 tons.

At Cripple Creek the Metallic Tunnel Co. projects a 100-ton cyanide and chlorination mill to cost $25,000.

The Granite mine, on Battle mountain, shows a large ore body at the 1000-foot level. In the upraise at this point the ore body is 78 feet wide and it ships, with little sorting, at the rate of $50 a ton, thirty-five tons being shipped daily.

In the Pueblo the works are in good ore. A carload went $40 tn the ton.

An idea may he had of the remarkable values contained in some of the ores of the Cripple Creek district hy the returns of a small consignment sent from the Miller & Baker lease on the Gold Dollar, on Bescon hill. The lot contained twenty-seven pounds and was saved during the sorting of eighteen tons of $80 ore. The Eagle sampler made a settlement on a basis of 1664.765 ounces to the ton, or a cash value of $33,295 30 a ton.

Two bodies of ore are being developed from the 600-foot level of the Woods Morning Glory shaft, on Doctor-Jack Pot ground, Cripple Creek. Lessees are shipping forty tons a day of $40 ore.——Clark & Pinson, operating on the Anaconda, have returns on fifteen tons of $95.60 to the ton.

The Arequa reduction plant, below Elkton, is making a specialty of dump material that runs $4 to $15 per ton. The lessees are using the cyanide method and are treating seventy-five tons per day. Most of the dumps selected are of oxidized ore; those carrying considerable sulphides are not so profitably treated.

Shipments from Stratton's Independence average ten broad gauge cars daily. Development is being carried on in the levels at 1150 and 1450 feet. The exact status of this work is not known.

Stratton's Chicago and Cripple Creek tunnel, cutting Gold hill, has been driven 3700 feet from the mouth to the hreast. Thirty men, in two shifts, are at work and the rock is being broken with a machine in the breast. It is being driven to connect with the Plymouth Rock shaft, which is to be sunk 2000 feet. Some ore has been found while driving the tunnel. A vein 3 feet wide was cut in a crosscut 700 feet from the tunnel, 1300 feet from the mouth. Then a basalt dyke was cut, the ore being mined and from which shipments are being made, runs 3 ounces of gold to the ton. Three machines are driving from a distance of 800 from the tunnel mouth in a crosscut, which has been driven 600 feet to cut the basalt dyke.

IDAHO.

BOISE COUNTY.

Norman Gratz, general manager Basic Placer Co. at Centerville, says his company is handling 1500 cubic yards gravel daily. The Basic Co. this year has one dredger in operation.

CASSIA COUNTY.

The Gold Hill is one of the pioneer gold producers of Idaho, but on account of litigation has not been in operation for some time. The courts have decided that the Gold Hill is the property of George Grayson of Oakland, Cal.

IDAHO COUNTY.

Roosevelt, Thunder Mountain, reports

100 men on Monumental creek who have been on short allowances for a month. A supply point has been selected on the east side of this summit, on the Salmon river slope, which can be reached by the Salmon City route, and from this point the supplies will be packed on the backs of the purchasers. The trails are still blocked to horse travel. Both snow and high water are now encountered on all the trails. The blockade will last perhaps twenty days yet. It is now claimed that deposits of sylvanite exist. The placer deposits are on the summits. The richest ores are found on the combs of the divides.

Returning miners from Thunder mountain deny the published reports that pack trains or even horses are getting there over the Florence-Warren or any other road. More than one trail will be opened by next week.

SHOSHONE COUNTY.

At Wallace men are running the lower tunnel to cut the ledge 400 feet lower than the old shaft.

WASHINGTON COUNTY.

In the Meadows district an option has been secured by W. T. Herndon on the West Fork, Viola and other mines. A 3-stamp mill and concentrator will be erected.

MICHIGAN.

In the Lake district the copper output of the twelve leading mines for 1902 is estimated at over 200,000,000 pounds, an increase of nearly 50,000,000 pounds over 1901. Estimated: Calumet & Hecla. 90,000,000; Tamarack, 19,000,000. Quincy, 22,000,000; Osceola, 20,000,000; Trimountain, 10,000,000; Isle Royale, 6,000,000: Atlantic, 6,000,000; Wolverine, 7,000,000; Baltic, 9,000,000; Mass, 4,500,000; Franklin, 5,000,000; Champion, 4,000,000; Miscellaneous, 5,000,000. Total, 207,500,000.

MISSOURI.

TANEY COUNTY.

A deposit of zinc has been found in Taney county on the property of the Horton-Dunckel Lumber Co., in the bed of Turkey creek, near the Arkansas line. Samples of the rosin jack taken from this point assay 65%. The prospect has been acquired by a St. Louis company.

MONTANA.

FERGUS COUNTY.

In thirty-three deeds filed with the recorder, F. A. Heinze and a number of associates transferred their individual interests in mining properties to a number of corporations. The deeds are from F. A. Heinze, A. P. Heinze, J. H. Tresise, T. M. Hodgens, P. S. Dudley, M. M. Bacon and H. S. Lacey. The corporations to which the Nipper, Minnie Healy and a number of other mines were transferred were: Nipper Con. M. Co. of New York, Cora-Rock Island Purchasing Co., Minnie Healy and the Montana Ore Purchasing Co. The revenue stamps upon the deeds indicated a consideration of $3,000,000 in the transfers. The transfers are said to be along the line of consolidation that is in progress in the mining interests that are controlled by Mr. Heinze under the title of the United Copper Co.

The 350-ton mill of the Kendall G. M. Co. has started and is driven by electricity generated 6 miles from the mine. The water power is used to pump water 6 miles to the mill. The main mill building is 180x55 feet, in which are rock crushers, twelve 150-ton leaching tanks, sump tanks, gold tanks and the machinery for extracting gold by the cyanide process. The ore is mined through the tunnel by the caving process. There is a shaft 200 feet, with drifts running southwest 400 feet in ore. Crosscuts show the ore averages 90 feet width.

At Kendall the Barnes-King Co. cleanup last week produced four bars of gold bullion, $8000. The hoisting engine at the new shaft is in place.

FLATHEAD COUNTY.

(Special Correspondence) — The new mining camp of Cabinet has a postoffice, the Government contract for carrying the mail between Libby and Cabinet has been let, and regular stages will soon be running. This new camp is situated in the western part of Flathead county, in what is known as the West Fisher district. The ore is a free milling gold quartz.

Manager W. J. Beager of the American Kootenai M. & M. Co. is back from Cleveland and New York and will install electric drills.

The Libby M. Co., composed of Flathead county men, will soon have their new mill completed and in running order. The machinery was taken in on the snow last winter.

Cabinet, May 20.

JEFFERSON COUNTY.

The Armilda, on Ophir gulch, owned by J. B. Bousevitz, has been developed by drifting in the tunnel. Two carloads of green malachite ore were taken out which carried high values in copper, besides gold. A winze has been sunk 35 feet, which shows a vein 4 feet thick on the contact between lime and granite.

There is much activity in the Ophir Gulch district, near Blackfoot City, and considerable prospecting going on.

G. Green of Helena has a contract for a 10-stamp mill at Contact, Boulder district. It will be running June 15.

A 20-stamp mill will go on the Big Elk mine, 20 miles from Contact and 10 miles from Independence, on the Boulder river.

LEWIS AND CLARKE COUNTY.

The sapphire mines on Rock creek, south of Phillipsburg, owned by the New Mines Syndicate, are being worked.

The tunnel on the Argo claim, owned by the Argo G. & C. M. Co., is in 820 feet.

The tunnel on the Canyon G. & C. M. Co.'s property on Magpie gulch, 20 miles north of Helena, across the river from Canyon Ferry, is in 720 feet, of which 350 feet is on the pay shoot. A shipment is sacked, awaiting better roads. This is a test shipment of copper ore.

The tunnel on the Snowshoe, on Snowshoe gulch, near Elliston, is in 500 feet and looks well in the face.

At the Hird & Mitchell property on Tiger hill, in Ophir gulch, which is being developed by W. A. Clark, the shaft is down 200 feet. There is much water and the pumps have all they can handle. Work goes on with three shifts of men.

The final payment on the Surething group at Elliston has been made. The payment was $2500 cash, total price $20,000. The property was looking so well that payment was made in full four months before it was due. The mine is developed by a tunnel 700 feet on the vein. The whole length of the tunnel carries from 4½ to 10 feet of ore which nets $20 to $35 per ton. The rest is good concentrating grade. The ore carries gold, silver, copper and lead. Shipments have averaged twelve cars per month. P. Mack is Supt.

MADISON COUNTY.

The Fairweather M. Co., organized under the laws of South Dakota, will operate the U. S. Grant group of mines, a mile from Virginia City.

Supt. Pankey of the Easton mine started the mill last week. He will run the tramway and hoist the ore from the second-class dump to the mill for treatment.

The Big Show M Co. has bought eleven mining claims 7 miles from Twin Bridges. Two of the claims adjoin the Bilehaugh and Keynote groups. The Bilebaugh, Keynote and Lulu claims are included in the purchase.

SILVER BOW COUNTY.

The Anaconda Co. intends sinking a shaft 5000 feet deep on the flat in the southeastern part of Butte.

Danielsville is the latest scene of a "rush." There are 3 feet of snow, but this does not deter those interested in mining. The mine opened up there is an 18-foot ledge of free-milling ore, assaying $300 per ton. The distance from Anaconda to the new camp is 25 miles by stage.

NEVADA.

ESMERALDA COUNTY.

The new mining camp Weepah is 10 miles west of Lone Mountain, 12 miles from Silver Peak, 6 miles from the nearest water. A road is being built to the Peak.

LINCOLN COUNTY.

(Special Correspondence)—Como district is in the Como range. The townsite is about 15 miles south of the Comstock lode and has an altitude of 7040 feet. Dayton is 10 miles distant. The district is traversed by immense quartz ledges, the croppings of which varying from 60 to 200 feet in width are traceable 4 miles. Proximity to the Comstock, which at the time absorbed the entire interest of capital, made Como a poor man's camp, and its discoverers not having the means to cope with the water which was found almost at the surface, abandoned the district. The greatest depth attained was 275 feet, from which depth a 650-gallon-per-minute pumping plant was unable to hold the water. A tunnel 8000 feet in length would cut the ledge at a depth of 1450 feet and insure the absolute drainage of the district. The mouth of the tunnel would be on a flat 6 miles above Dayton. The drainage water is cold, pure and palatable, and the nature of the country would insure plenty of it for all purposes The geology of the district is similar to that of the Comstock. The country rock is dibasic. The ledge matter is mainly quartz, the clay and decomposed country rock deposits of the Comstock are apparently absent, as are also the Comstock characteristics of streaks and bunches of pay, with bonanzas and barren zones. The pay veins are from 8 to 160 feet in width and the ore continuous. The main lode bears north 37° east. Prospecting shows it to contain veins in which the gold value predominates over the silver value. The May Day vein crosses the main lode at nearly right angles.

Como, May 27.

The Quartette mill has started and is working on ores from the Dunn group at Searchlight. The company has constructed a narrow gauge road, 17 miles in length, from their 20-stamp mill on the Colorado river to their mines at Searchlight. A locomotive and eight cars of sixty tons capacity makes two trips per day.

A charter is granted at Dover, Del., to the Tonopah Water & Power Co. of Carson City to conduct power and water from Twin river, Nye county, 70 miles.

The Alps mine, a one time producer, is being worked on a lease at Pioche and a recent strike is reported in lower levels.

At Searchlight the railroad from mill to mine is finished.

E. C. Higginson has placed the Bingham & Welland group, 4 miles west of Pioche, with F. O. Richardson of British Columbia, price paid $20,000. Development has begun. The ores carry gold, silver and lead.

The Rambler group of claims has been sold and development work is going on.

The Quartette M. Co. own twenty claims in the Searchlight district and have been developing their properties for 3 years. They have a 20-stamp mill and cyanide plant erected on the Colorado river, 10,000 feet of underground development work on their claims and a narrow gauge railroad 16 miles in length, between the Copper King mine and the mill, tapping other claims en route. At the 500-foot level in the Copper King mine the ledge is 30 feet wide, averaging $17 per ton free gold.

The Southern Nevada M. Co. have purchased two properties. They are quarrying the ore and saving $15 per ton on the plates.

The Searchlight group has been purchased and operations are in progress; F. P. Swindler, manager. Foundations are completed for a 10-stamp mill. It will be running July 25th.

The North Rapidan tunnel at Como is in 2200 feet and has tapped the Mt. Como incline.——A 100-ton run from the Lizard mine was finished in the Pfeifer mill in Six Mile canyon last week. —— The Heather M. Co.'s cyanide plant in Six Mile canyon has begun operations on slimes and tailings, working forty tons per day.

NYE COUNTY.

There are in Tonapah sixteen companies putting down double compartment shafts on the line of the main veins.

STOREY COUNTY.

In the Gould & Curry mine, east crosscut No. 1, from the northwesterly drift on the 425 level, was advanced 11 feet last week; total distance, 21 feet. The face is in clay and quartz giving low assays.

In the Mexican mine the double-compartment upraise above the 1600 level is up 38 feet. The top is in porphyry and quartz.

On the 1600 level of the Union shaft the joint Sierra Nevada and Union crosscut from the main west drift and the Union Con. south drift are both in porphyry.

In the Utah Con. mine the south drift started in surface tunnel No. 2, at a point 797 feet in, is still in quartz and porphyry.

WASHOE COUNTY.

The Sparks mill at the Wedekind mine is ready to begin.

NEW MEXICO.

COLFAX COUNTY.

The Ora Dredge Co., operating on the Lynch placers near Elizabethtown, is working a full force.

GRANT COUNTY.

The Alessandro M. Co., operating in the Burros, has purchased the Red River mine, in White Signal district, to secure a water supply for its leaching plant.—— The American Con. C. Co. will begin development on the Copper Ring and Little Burro.——The South Side group, on Telleck mountain, White Signal district, is being thoroughly prospected.——A contract for 100 feet on the Silver Reef, in Bullard's Peak district, has been let. At a depth of 20 feet high silver values were struck.

The Hooper Milling Co. will build a 500-ton concentrator at Lordsburg if sufficient tonnage is assured.——The Aberdeen Co. has fifty men on the payroll and the plant has begun turning out concentrates.——The North American Co. will develop their mining properties in the Virginia district.——It is reported that the Volcano camp will start up next week.

The Hoosier Milling Co. has agreed to build a 500 ton concentrator at Lordsburg if sufficient tonnage is guaranteed.

The Aberdeen concentrator started up May 16 and has turned out some fine concentrates. As the rock is hard for the machinery more rock breakers will be put in.

The gold and silver mill at Volcano camp, near Lordsburg, will begin operations June 1st.

LINCOLN COUNTY.

The Eagle M. & I. Co. will build a cyanide plant before July 1. J. M. Rice is manager. The company has bought 200 mining claims. A dam will be constructed across the Bonito to furnish power.

SANTA FE COUNTY.

The recent strike of a 20-foot vein of lead, copper and silver in Macho canyon, on the Pecos forest reserve, shows a vein of galena 2 feet 8 inches wide.

SIERRA COUNTY.

The management of the Mamie Richmond mine at Hillsboro will erect reduction works and thoroughly open up the property.

SOCORRO COUNTY.

The Cooney mine has closed down temporarily on account of the high freight rates to Aguas Calientes, Mexico, that being the nearest smelter since the El Paso plant cannot take care of the ore.

TAOS COUNTY.

The Frazer Mountain C. Co., at Twining, has completed its new mill and smelter building. Five concentrators, two compressors, two water wheels, electric dynamos and the smelter apparatus are in the building. The pipe lines extending from the Hondo river are completed.

VALENCIA COUNTY.

A discovery of opals is reported from the Peralta canyon, Cochiti district.

Lithographic stone has been discovered in this county. Bavaria has been a source of supply. The Valencia county rock is clear and fine.

OREGON.

DOUGLAS COUNTY.

J. H. Booth has sold his interest in the Granite Hill mines of Louse creek district for $11,700. Supt. C. L. Mangum says that by August 1st a hoist and five additional stamps will be put in.

BAKER COUNTY.

(Special Correspondence).—Some good ore is being taken from the Blue Bird group, Red Boy district. A tunnel has been started to tap the ore bodies at depth. J. A. Hilliker, representing the Western Union M. & D. Co. of Minneapolis, has bought the Monte Cristo group of six claims for $60,000. The 5-stamp mill on the Clipper mine is completed and running. The Perry Rachel mill has made a test run and saved 80% of the values on the plates. The ore runs from $8 to $10 per ton. The tallings will be banked for the present.

Sumpter, May 23.

JACKSON COUNTY.

E. Briggs has bought the Big Foot mine west of Gold Hill, for $3000. H. A. Corliss and B Rush have bonded the Lucky Queen and Blue Rock to C. D. Crane.

JOSEPHINE COUNTY.

A company has been incorporated by Eureka, Cal., people to develop gravel ground at Althouse in Josephine county; capital stock $50,000.

SOUTH DAKOTA.

Black Hills plants are daily reducing 5970 tons as follows:

	Tons.
Homestake M. Co., 900 stamps, free milling	3,600
Clover Leaf M. Co, 60 stamps, free milling	240
Holy Terror M. Co., 20 stamps, free milling	80
Tycoon-Ranger M. Co., 10 stamps, free milling	40
North Star and other Southern Hills, free milling	100
National Smelter Co., smelter	300
Golden Reward M. Co., smelter	300
Golden Reward M. Co., cyanide mill	200
Wasp No. 2 M. Co, " "	100
Horseshoe M. Co., " "	100
Spearfish M. Co., " "	300
Deadwood-Standard Co., " "	200
Portland M. Co., " "	60
Dakota M. Co., " "	100
Imperial M. Co., " "	100
Highland Chief M. Co., " "	50
Alder Chief M. Co., " "	50
Rossiter (under lease), " "	50
Total	5,970

The National Smelting Co. has completed its smelter at Rapid City. The Horseshoe M. Co. is shipping 300 tons daily of smelting ore. The company will build a 300-stamp cyanide mill, capacity 1200 tons per day.

The Black Hills is now treating by home plants—stamp mills, smelters and cyanide mills—at the rate of 179,000 tons monthly, and shipping to outside smelters

10,500 tons per month, a total monthly production of gold ore of 189,500 tons.

LAWRENCE COUNTY.

The Spearfish M. & M. Co., at Spearfish, will resume operations with 100 men. The ore is a free milling and cyanide proposition.

UTAH.

BEAVER COUNTY.

A 100-ton smelter is to be built by the Majestic M. Co. at Milford; A. B. Lewis, manager.

W. A. Farish, in a report on the properties of the Majestic M. Co, recommends the erection of a smelter at Milford; he believes 1000 tons of ore can be supplied daily. The dump of the O. K. mine contains 20,000 tons, averaging in value 6.6% copper, four ounces silver and $1.60 gold.

IRON COUNTY.

The Johnny mine at Stateline will build a new mill. This mine has been well developed to 260 feet; grade of ore is high. W. J. Dunley, Stateline, Supt.

The Willowvale at Stateline is locally credited with having 20,000 tons free milling ore in the workings of the 600-foot level.

The Ophir has a mill of 100 tons capacity, and a leaching mill. The main shaft is 500 feet deep. Fifty men are employed.

JUAB COUNTY.

The 100-stamp mill on the property of the Eureka Hill M. Co. at Eureka may resume on custom ores.

SALT LAKE COUNTY.

The Highland Boy Con., Bingham, has ores showing 35% lead, ten ounces silver, 1.8% copper and $1.20 gold per ton in the Leonard tunnel. Supt. Smith reports 18 inches of this ore, which also shows an iron excess.

The U. S. M. Co. at Bingham will do nothing until the new smelter goes into operation next September.

SUMMIT COUNTY.

The Storey group of mining claims at Park City has passed into the control of N. Treweek, general manager for the Wabash M. Co., consideration $60,000. Prospect work will begin in the 600-foot level in the Wabash. The Storey group consists of the Storey, Alaska, Mammet Neptune, Franklin and Fraction, and adjoins the west line of the Wabash.

TOOELE COUNTY.

The Trapper's Pride will have a 75-ton mill; manager, C. F. Peterson, Kimberly.

The presence of quicksilver in commercial quality in the Sacramento of Mercur attracts attention.

UINTAH COUNTY.

Near Vernal the St. Louis Co. is figuring on a monopoly of the gilsonite business. At Fort Duchesne the company is now operating a mine, the material from which will be used to pave the World's Fair grounds at St. Louis, and from which thousands of tons of ore are being shipped 100 miles by wagon to Price. All teams loading freight for any point in Uintah county are loaded back to Price with gilsonite, as everything that is used at Fort Duchesne, the two Indian agencies and Vernal comes by wagon, employing many teams. The mine at Duchesne has a vein averaging 3 feet in thickness; the ore can be mined for $1 a ton. On White river there are veins of gilsonite 15 feet wide. These deposits will be almost directly on the line of the Denver, Northwestern & Pacific Railroad, as projected.

WASHINGTON COUNTY.

It is reported that copper ore has been discovered in the Last Chance mine.

WASHINGTON.

FERRY COUNTY.

W. Crummer of Republic has charge of the Quilp, Black Tail, San Poil, Gold Ledge and Silver Dollar mines, and will buy a complete set of machinery for the Silver Dollar mine. The property is being developed by a double-compartment shaft, to be sunk 300 feet, before crosscutting to the ledge.

It is expected that the Great Northern will be running trains into Republic by July 1st. The company is building spurs to the ore dumps in the various mines in the camp. The road will thus be ready to take out ore very shortly after reaching the camp.

The Quilp, Black Tail and the San Poil are all to ship ore when transportation facilities are perfected.

SNOHOMISH COUNTY.

At Index, the Siberia tunnel on Silver creek is in 316 feet. An assay of 7 feet in the face of the drift gave $20 per ton gold. It is a concentrating ore. The gold bearing minerals are arsenio-pyrite and yellow pyrites of iron.

The main tunnel of the Nonpareil, near Index, is in 300 feet and in ore.

WYOMING.

CARBON COUNTY.

At Cow creek, near Encampment, the Newton has a shaft 85 feet and shows a 5-foot vein carrying copper and gold. The Indianapolis is down 40 feet with a vein 9 feet wide. The shaft on the Blackfoot is 75 feet deep.

FOREIGN.

AUSTRALIA.

The gold yield of New South Wales during April was 30,701 ounces, valued at £108,132, as compared with 27,017 ounces, valued at £80,856, in the same month last year. The yield for the first four months of 1902 amounts to 110,650 ounces, valued at £390,663, as compared with 84,090 ounces, valued at £286,947, for the corresponding period of 1901.

BRITISH COLUMBIA.

The output of the Granby mines at Phœnix, now amounting to 1500 tons daily, is to be increased. Two additional compressor plants, each with a capacity of thirty drills, will be installed, permitting a daily production of from 2500 to 3000 tons to be steadily maintained. J. P. Graves, manager of the company, says: "Porter Bros., the railway contractors, have taken a contract for quarrying 100,000 tons of ore from the surface or glory holes of the Granby group, with the understanding that they will be ready to undertake the extraction of 5,000,000 tons of ore. Porter Bros. are to install derricks and steam shovels. The ledge across the Granby group has already been partially stripped, but it will be stripped for an additional length of 1500 feet and for a width averaging 200 feet. This is being done independent of the underground development work by the company. The Cascade Power Co. has contracted to supply 1500 H. P. and an extra 500 H. P. for proposed enlargements, including two additional furnaces for the smelter at Grand Forks as contemplated. When the new plant is installed the mine can produce a tonnage of from 2500 to 3000 tons daily."

The production of the silver-lead mines of British Columbia for four years past is as follows:

	Lead, lbs.	Silver, ozs.
1898	31,693,559	4,292,401
1899	21,862,436	2,937,413
1900	63,358,621	3,958,175
1901	50,529,260	2,624,002

ROSSLAND MINES' LIST.

Properties.	Men employed.
Le Roi mine	350
Centre Star	100
Josie	168
Velvet	100
War Eagle	90
Number One	35
Nickel Plate	22
White Bear	17
Columbia-Kootenay	15
Green Mountain	12
Spitzee	6
Abe Lincoln	6
Total	921

Finch & Campbell, who control the Second Relief, near Ymir, will put in a cyanide mill, capacity 50 tons per day.

The Sunset mine, at Cody, paid a regular monthly dividend of $6000 on the 17th inst. A specimen of solid galena weighing 125 pounds, containing 185 ounces of silver, 82% lead, was recently taken from this property.

The Arlington mine shipped forty tons ore last week and the Enterprise shipped twenty tons concentrates. The total shipments from Slocan City for the year amount to 1450 tons. The aggregate of shipments for the year for the whole of the Slocan district, 18,467 tons.

Ore shipments through Kaslo for the past week were 333 tons, as follows:

	Pounds.
Rambler to Everett	131,000
Rambler to San Francisco	122,000
Whitewater to Trail	129,000
Slocan Star to Everett	85,000
American Boy to Everett	82,000
Sunset, Cody to Nelson	40,000
Sunset, Cody to Trail	37,000
Reco to Nelson	40,000
Total	666,000

Work on the Marysville smelter at East Kootenay is nearing completion and the smelter will be blown in July 1st. This smelter is being built by the Sullivan mine, in which there are 150,000 tons of ore blocked out.

The Ollala C. M. & S. Co. will develop their holdings in the Similkameen valley, consisting in part of sixty mineral claims, the townsite of Ollala, with a charter for the Similkameen & Koremeos railroad, telegraph and telephone franchises.

The Standard Oil Co. has bought for $52,000 the Mound and Copper Cliff claims adjoining their Nickel Plate property on Copper mountain in the Similkameen country.

In Cariboo indications are a short water season for hydraulic miners. Prospecting in the higher mountains for quartz and placers will be the order in Cariboo this summer.

The Mines Exchange at Nelson reports that at Lardeau, in running a crosscut tunnel on the Beatrice to tap the galena vein from which 221 tons of silver-lead ore, valued at $145 to the ton, has been shipped, a 4-foot vein of good gold-bearing quartz was struck.

In Boundary, W. Fowler, who holds a $10,000 bond on the Providence mine, 2 miles from Greenwood, has sold a half interest for $25,000—$8000 cash, $17,000 in three and six months. The purchasers are W. M. Law, H. F. Myttun, F. Whitwell of Greenwood and E. L. Tate of Spokane, Wash.

COSTA RICA.

In Costa Rica two groups of gold mines are being worked regularly, the Bella Vista group, near Miramar, 15 miles from Puntarenas, and the Abangares group, 18 miles from Puerto Yglesia, on the Gulf of Nicoya. The Bella Vista and Thayer mines adjoin, each have a 20-stamp mill of 850-pound stamps and cyanide plants. The ore is low grade. The mines have paid expenses. The Abangares gold fields of Costa Rica include the Tres Amigos, Tres Harmanos and Boston mines. The Abangares Co. is increasing its plant, substituting for steam power, water power (300 H. P.) with electrical transmision, enlarging its mill and cyanide plant and putting in air compressors for drilling. The ore gives on a general average 15 dwts. to the ton.

MEXICO.

I. C. Whiting of Oaxaca, Mex., says the district is in the State of Oaxaca, more than 300 miles south of Mexico City. There are about 2000 white men in the district, which lies on the Mexican Southern railway. Several American companies are interested there; mills are being built and the railroad is building a 25-mile extension to bring machinery into the district. The ore is gold bearing, principally, and the returns are so large that it pays to spend $80 Mexican money to send a carload of ore 300 miles to Mexico City. Then it has to be shipped to a smelting point.

The American Smelting & Refining Co. is reported to have closed a deal for the mine holdings and mills of A. Garcia, including the Refugio mine. The price paid is stated to be $3,000,000 gold.

SONORA.

C. Hopkins of Boston has bought for Eastern men a group of claims 35 miles east of Cos, Sonora, paying $40,000 for the property. The new owners will erect a 100-ton cyanide plant with pans and settlers. Plans will be made to increase the capacity later to 1000 tons.

Stibnite (sulphide of antimony) has been discovered 10 miles from Nogales. Forty pertenencias have been denounced by C. Cameron.

The Belene C. M. Co. has bought three holdings at Copete. They are La Union, La Esperanza and Reina de Cobre, aggregating eighty-two and one-half pertenencias. The holdings of the company are now 162½ pertenencias. At 150 feet depth the main shaft has penetrated a body of chalcopyrite ore.

NEW ZEALAND.

The gold output of New Zealand during April amounted to 43,052 ounces, valued at £164,741, as compared with 22,580 ounces, valued at £83,467, in April last year.

SOUTH AFRICA.

The gold output from Rhodesia for the year 1901 amounted to 180,880 ounces, an increase of 69,385 ounces over the total output of 1900.

Books Received.

"The Science of Mechanics," by Dr. Ernst Mach, Professor of History and Theory of Inductive Science, University of Vienna; translated from the German by T. J. McCormack; second revised and enlarged edition, 259 cuts and illustrations: 605 pages, 8vo., cloth, 1902. Dr. Mach has a pleasing way of introducing the problem by a personal introduction to the authors of the problem, whose names are familiar to all, but whose personality now becomes real. The mechanical processes, the principles of the lever, inclined plane, composition of forces, are endowed with a new charm, and the student may walk arm in arm with his old friends, Galileo and his pendulem, Huygens and his clocks, and Newton with his apple. The book is commended to all who desire a broader view of the science of mechanics than is obtained from some mathematical works of the day. Open Court Publishing Co., publishers, Chicago. Price, $2.

Personal.

JOHN T. GRAYSON has located in Boise, Idaho.

L. C. TRENT is returning to Utah from Tasmania.

J. A. BEST is Supt. Red Cross mine, Omega, Cal.

J. B. FRISBIE of Vallejo, Cal., has returned from Mexico.

P. STINGLE is superintendent Golden Queen at Kelsey, Cal.

C. CONNALLY is superintendent Hardtack mine, Carters, Cal.

C. E. PURRINGTON is Supt. Fremont Con. mines, Jackson, Cal.

G. W. HULL has returned to Jerome, Arizona, from New York.

J. R. RITCHIE has returned from San Francisco to Nevada City.

F. E. WILSON is general manager Friday group, Baker City, Or.

EDW. KEHOE has gone from Spokane, Wash., to Park City, Utah.

W. A. FARRISH has returned to Denver from Utah and Nevada.

A. C. HARMON is Supt. Campo Seco copper mine, Campo Seco, Cal.

CHAS. BUTTERS has left California for a six weeks' sojourn in London.

C. F. HORN is now in charge of the Terrible mine and mill, Ilse, Colo.

HORACE F. BROWN has returned from Groveland, Cal., to San Francisco.

F. M. CZARNOSKI is general manager Leviathan G. M. Co., Wickenberg.

W. H. STORMS, Supt. Baliol mine, Amador Co., Cal., is in San Francisco.

ANDREW DYATT takes charge of operations at the Bassick mine, Querida, Colo.

G. SIMMERS of San Francisco is superintendent Hilda mine, near Downieville, Cal.

T. B. MCKILLIGAN has been appointed inspector of mine revenue for British Columbia.

J. W. HOPKINS is superintending the Great Western mine, Steamboat Springs, Nevada.

COL. HAYWARD, W. HOBART, C. D. LANE AND W. A. NEVILLS are in Angels Camp, Cal.

SUPT. WOLFE of the Polaris M. Co., Clifton, Arizona, has returned from El Paso, Texas.

COL. W. H. HEUER, corps U. S. Engineers, has returned to San Francisco from Seattle, Wash.

W. SCALLON, general manager Amalgamated Co., has returned to Butte, Mont., from the East.

J. F. PARKS, Supt. Kennedy and South Eureka mines, Amador, Cal., has returned from the East.

P. W. GATES has been elected director of the Allis-Chalmers Co., succeeding the late W. L. Elkins, Jr.

CLARENCE HERSEY of Denver has returned from western Oregon, where he has been examining properties.

A. DRON has been appointed Supt. Dexter - Tuscarora mill, Elko, Nevada, succeeding H. O. Milner, resigned.

W. D. JAMESON, representing the Joshua Hendy Machine Works of San Francisco, Cal., is in Seattle, Wash.

F. A. JONES, formerly director School of Mines at Socorro, N. M., is making a geological survey of Grant county, N. M.

A. MORGAN, superintendent of the Beatrice mine at Murphys, Cal., has resigned; R. E. Ober has taken his place.

J. AUDLEY SMITH, general manager Boston & Seven Devils Co., has returned to Weiser, Idaho, from New York City.

E. S. WHITE, J. A. CORAM AND D. MCVICHIE of the Bingham, Con., Utah, are observing smelting operations in Montana.

MANAGER SHIPMAN of the Independence mine at Cripple Creek will be appointed manager of the Camp Bird at Ouray.

CAPT. E. O. C. ORD, U. S. A., president Crystal Lake G. M. Co., Meadow Lake, Cal., is in San Francisco, en route to Manilla under orders.

C. D. JAMESON, assistant manager National Smelting Co, Rapid City, S. Dakota, having completed his work at that plant, has resigned.

AT Houghton, Mich., R. Cocking, assistant mining captain of the Quincy, has resigned, and he goes to the Adventure as head mining captain.

ASSISTANT CHIEF MINING CAPTAIN JAMES HOATSON of the Calumet & Hecla, Houghton, Mich, has resigned, his resignation to take effect to-day.

E. A. WILTSEE has returned from San Francisco to Denver, Colo. While in California he, in company with J. H. Hobbs and J. S. Tucker, closed a deal for

2000 acres dredger placer ground in Stanislaus county, Cal.

RICHARD F. PEARCE, general manager of the Colorado smelter, Butte, Montana, has resigned to go into the brokerage business in New York City.

DANIEL MACLAREN, who has been inspecting mining properties at Cripple Creek district, has gone to Sydney, Australia, whence he goes to Chile.

E. C. ENGLEHARDT has assumed the position of superintendent the New Jersey Copper Gold Co., operating the old Harrison Reduction Works, Leadville, Colo.

R. HARDROP, formerly of the Esperanza mine, near Greenwood, El Dorado Co., Cal., is at that place engaged in mine examination in the interest of British investors.

N. S. SHALER, Dean Lawrence Sc. School, Harvard University, and Professor of Geology, is also manager of placer properties, Beaverhead county, Montana.

H. J. THOMAS has resigned as superintendent of the Hardtack, and accepted similar position near Grass Valley, Cal., for T. J. McAvoy, who owns the Standard group of mines.

WILFRED PROCTOR has returned to Oakland, Cal., for six months, from the U. S. of Colombia, S. A., where he is manager of a placer gold mine for an English company.

Catalogues Received.

The catalogue of the American Concentrator Co., Joplin, Mo., fully illustrates and intelligently describes the magnetic separator and the concentrator that that company makes and supplies. Sectional views and detailed statements make plain the workings of these devices.

In gold and green is the latest catalogue, No. 69, of the Jeffrey screening machinery, sent by the Jeffrey Mfg. Co., Columbus, Ohio. Those screens treat all sharp and gritty materials and elaborately illustrated descriptions are interspersed with testimonials from pleased patrons everywhere. Some space is also devoted to the Jeffrey sand and gravel excavating machinery. Frank Field, Equitable Bldg., Denver, or the home office will send this sumptuous booklet on request.

The Westinghouse Electric & Mfg. Co. has recently issued a circular describing "electric motor vehicle equipments." This company has for five years supplied motors to the electric vehicle industry and now offers a complete line of standard automobile equipments comprising everything of an electrical nature, except storage batteries, pertaining to the motive power of an electric vehicle of any type or size. This circular will be sent upon request. The San Francisco office is in the Mills Bldg.

Bound in red and hound to be read is the descriptive treatise on the Durkee electric drill, issued by the Mine & Smelter Supply Co. of Denver, Colo. Everything is judged largely by appearances, and the fine paper, handsome half-tones and intelligent description of the device would naturally create a favorable impression concerning this valuable mining appliance. There is a detailed description of how to handle the drill, of interest to all mining men, and the 124 parts of the drill are numbered, named and illustrated in detail. The catalogue will be sent on request by any of the company's offices at Denver, Salt Lake City, El Paso or City of Mexico.

The Holthoff Machinery Co., Cudahy, Wis., send section I of their mining machinery catalogue. This is the first catalogue they have issued, and is devoted to a general illustrated description of gold and silver mining and milling machinery; that is, equipment for ore reduction by milling and chemical processes. The typography is excellent, the descriptive matter brief and clear, and the portrayal of the different devices and apparatus equal in tone and treatment to the best magazine work. A request to the home office, Cudahy, Wis., Thos. Fielding, 1711 Tremont St., Denver, Colo., or Dederichs & Burke, 229 Atlas Block, Salt Lake City, Utah, will secure a copy of this handsome treatise.

Commercial Paragraphs.

THE Star Drilling Machine Co. of Akron, Ohio, will erect three additions to its plant.

WM. HOSKINS & CO., of Chicago, report a recent sale of their furnaces and blowpipes to the National Bureau of Standards of the Treasury Department, for use in studying the conditions of fusion, etc., of various alloys.

THE Ingersoll-Sergeant Drill Co. of New York City has established an office at 1212 Park building, Pittsburg. The company has received an order from the Gold Creek Con. M. Co. of Jersey City for a complete outfit to be used at the Mascot group.

Recently Declared Mining Dividends.

	Payable.
Bald Butte M. Co., Montana, 6 cents per share; $15,000	June 6
United G. M. Co., Colo, No. 1, 1 cent per share, $39,947.60	June 6
Magnolia G. M. Co., Colo., 1 cent per share, $11,000	June 5
Sunset M. Co, British Columbia, $6000	May 17

Latest Market Reports.

SAN FRANCISCO, May 29, 1902.

METALS.

SILVER.—Per oz., Troy: London, 23¾d (standard ounce, 925 fine); New York, bar silver. 51⅝c, refined (1000 fine); San Francisco, 51⅝c; Mexican dollars, 44½c San Francisco, 41⅝c New York.

COPPER. — New York: Standard, $11.75@12.00; Lake, 1 to 3 casks, $12.35; carload lots, $12.00; Electrolytic, 1 to 3 casks, $12.00; carload lots, $11.75; Casting, 1 to 3 casks, $12.25; carload lots, $11.25. San Francisco: $14.00. Mill copper plates, $17.00; bars, 18@24c. London: £52 17s 6d per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £11 10s per ton.

SPELTER. — New York, $4.60; St. Louis, $4.00; London, £18 10s per ton; San Francisco, ton lots, 5½c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN. — New York, pig, $30.10; San Francisco, ton lots, 31½c; 1000 lbs., 31¾c; 500 lbs., 31¾c; 200 lbs., 32c; less, 32½c; bar tin, ℔, 37½c.

PLATINUM.—San Francisco, orude, $17 ℔ oz.; New York, $18 per Troy oz

QUICKSILVER. — New York, $50.00 large lots; London, £8 15s; San Francisco, local, $46.50 ℔ flask of 76½ lbs.; Denver, $50.50. Export, $44.50.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16½c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.75; gray forge, $19.50; San Francisco, bar, 2.75 ℔ lb .,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $33.00; open hearth billets, $33.50; San Francisco, har, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per hbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19 50; extra sizes higher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19.00; shingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17¼c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11¾c; led, than one ton, 13¾c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10o ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11.75, long ton.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66° B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2¾@3c ℔ lb.; blue vitriol, 5¾@6¼c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roil sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2¼@ 2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls. 8c: caustic potash. 10c in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 78c; cs., 83c; raw, bbl., 76c; cs., 81c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 68c; cs, 73c; raw, bhl., 66c; cs, 71c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13½c; Mineral Seal, iron bhls, 19c; wooden bhls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 15½c; do., cs., 21½c; 86° Gasoline, bulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14c; do., in cs., 20½c: Lard Oil, No. 1 hbl., 60c; cs., 65c; Neatsfoot Oil, bbl., 70c; cs., 75c; No. 1 bbl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¾c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb, 7¼c; less than 500 lbs., per lb., 7½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¾c; do. in kegs, 7½c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c.

ASSAY LITHARGE.—Per lb., 9c.

BISMUTH.—Subnitrate, per lb., $1.60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c: calcined, 20c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2⅛ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb, 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

WANTED.

Mine Blacksmith and Drill Sharpener to go to Hawaiian Islands—18 months. Unmarried man preferred; soher. Apply hy letter, with testimonials, to D. Y. Z, this office.

Wanted to Bond a Dry Placer Claim, One Rich in Flour Gold.

Must he a dry nroposition. Address "Placer Claim," care this office.

WANTED, for a developed mine in California, a competent mining engineer to look after development and exploration. Must he a full graduate of n recognized mining college and have had several years' practical experience in large iron, coal or copper mines, and he fully skilled in the engineering problems pertaining to extraction, haulage, ventilation, etc. Give full particulars of career, experience, age, etc, to "Vulcan," care of this paper.

WANTED.

Consulting Mining Engineer,

familiar with making examinations of mines, prospects and mineral lands. Address stating experience and references. Moderate salary to start, with advancement to competent man. Position permanent if found satisfactory. Address A., care of Mining and Scientific Press.

EXAMINATION OR SUPERVISION of Mines, Smelters and Mills.

Mining Engineer and Metallurgist, of unquestionable reputation and long experience, now permanently residing at Seattle, Wash., will examine or take general supervision of mines, smelters or mills, in Pacific Coast States, British Columbia or Alaska, as consulting engineer, for reliable parties. Is also reliable accountant to examine. Box 813, Seattle.

INVENTORS, Take Notice!

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SITUATIONS WANTED.

COPPER FURNACE FOREMAN with eight years' experience at matte and hiack copper work Best of references. Address V. H., care of Mining and Scientific Press.

PHYSICIAN AND SURGEON with three years' experience in hoth emergency and general hospitals, in addition to experience in mines and private practice, wishes position in a mine. Best of references. Address Box 126, care of this office.

CHEMIST AND ASSAYER, WITH TWENTY years' experience in mill and smelter work. Can run same. Address A. C., care of Mining and Scientific Press.

THUNDER MOUNTAIN.—A successful superintendent of over 15 years' experience and acquainted with this district, desires to take charge of property there for a good company. Address T. M., care of Mining and Scientific Press.

WANTED.—Position as Foreman or Superintendent of quartz proposition or developed mine. Timhering and air machine drills a specialty. Sixteen years' experience. No fake references furnished. Correspondence solicited. Present position not desirable. Address T. J. P., care of Mining and Scientific Press.

MINING ENGINEER, practical miner and mill man, assayer, etc., deeires position of superintendent or assistant manager of a hig property. Eleven years' experience. Best references. Now working in southern California. Address A. M. P., care of Mining and Scientific Press.

WANTED.—SITUATION AFTER MARCH 15, 1902, as Manager or Superintendent of mine. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work. Four years' experience as manager and superintendent. Treatment of low grade ores a specialty. Practical in every detail. State location of mine and salary. Best of references. Address X. Y. Z., this office.

A technically educated Mining Engineer, at present employed as superintendent of mines for one of the largest corporations in Mexico, desires a change of position to the United States about July 1st. Has had 18 years' successful experience as engineer and superintendent, never having made a failure; 36 years of age; strictly temperate; a skilled designer, geologist and metallurgist, and a practical miner, as well as a hard worker and thorough business man. References of the highest order, including present employers. Address Supt., care this office.

FOR SALE.

Fifteen-Ton Locomotive for Sale.

In good condition. Boiler 34 in. diameter; cylinders 10 in. diameter hy 13 in. stroke; fire box 40 in. long, 30 in. wide and 26 in. high (crown sheet over bars); 136 tubes; four 34-in. drivers; air pump cylinder and brake shoes. Price $1150.00. JAS. A. McMAHON, 6 California St., San Francisco, Cal.

FOR SALE--A BARGAIN.

3 Practically New Five-Foot Huntington Mills with Extras. All in Al Condition.

Also, 2 New Four-Foot Vanners. Absolutely New. Perfect Condition.

Address FRICOT & MILLER, Entrohe, El Dorado Co., Cal.

Gold Mining Properties For Sale.

Two First-Class Placer Mines, one having 20 years' record as a producer. Both in good working condition. Terms reasonable. Address "Enquire," care this office.

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Mines and prospects in British Columhia, th Western States, and Mexico, for sale.
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Bank references given.
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WEIGHT AND QUALITY GUARANTEED.

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New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING MAY 20, 1902.

700,292.—SASH CORD FASTENER—P. Barnum, S. F.
700,477 —SKIRT AND DRAWERS —Lillian A. Burgard, S. F.
700,675.—MOP BEAN—E. B. Campbell, Bakersfield, Cal.
700,819.—MOVING HEAVY BODIES—C. V. Fowler, Los Angeles, Cal.
700,321 —CONVEYING APPARATUS.—F. R. French, S. F.
700,352.—CAN HOLDER—L. Funck, Farmington, Cal.
700,194.—WASHING MACHINE — E. D. Hamilton, Vancouver, Wash.
700,337.—COFFEE CLEANER—W. A. Hastings, S F.
700,685 —WEEDING TOOL—H. Havil, Los Angeles, Cal.
700,493.—GRAINING APPARATUS — G. A. Herzog, S. F.
700,501.—HOUSE—W C. James, Cucamonga, Cal.
700,430.—BIT AND REAMER—G. A. Lane, Lakeside, Cal.
700,349.—VEHICLE BRAKE AND BELL—S. H. Madsen, Haywards, Cal.
700,350.—BICYCLE BRAKE—A. Main, Poweiton, Cal.
700,353.—HAY DERRICK—G. G. Mayenschein, Sunnyside, Wash.
700,359.—WRENCH—J D. McFarland, Jr., S. F.
700,227.—DOOR LOCK—A. Newell, Pasadena, Cal.
700,362.—WINDOW SCREEN — O. Niehaus, West Berkeley, Cal
700,704.—TANK HOOP FASTENER—C. L. Parker, Los Angeles, Cal.
700,243.—LOCK—G. T. Roberts, Coronado Beach, Cal.
700,243.—ROTARY ENGINE—S. S Rose, Amador, Cal.
700 710.—FENCE MACHINE—F. Stehler, Riverside, Cal
700,581.—SNAP HOOK—A. J. Towner, Santa Ana, Cal.
700,596.—ROAD SCRAPER—T. Wilcon, Meyers Falls, Wash

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

RIDGING PLOWS —No. 699,826. May 13, 1902. J. C. Silveira, San Francisco, Cal. This invention is an improvement on that class of plows which are designed to throw up a ridge or hill while moving over the ground. It is intended especially for the cultivation of asparagus and that class of garden truck which is thus ridged or hilled up. It consists essentially of a plow having an extended land side, means by which the latter may be held in the line of draft, a plowshare and braces between said share and the land side to provide a rigid structure, and a moldboard pivotally secured to the share and capable of being inclined either vertically or horizontally so as to vary the height of the ridge or hill turned up, or to increase or decrease the width of the furrow The inclination of the pole with relation to the plow frame may be regulated by pivoting the pole intermediate to its ends.

PUMPING APPARATUS.—No. 699,829. May 13, 1902. J. Alhrefczenski, San Francisco, Cal. The object of this invention is to provide a means for pumping water and the like by the action of flowing water upon a journaled wheel, and in conjunction therewith of a windwheel with intermediate gearing, so that the two may act together or separately as desired. Fulcrumed levers have their upper ends connected with eccentrics driven by the wheel and links by which the intermediate portions of the levers are connected with the plunger rods of the pump cylinders. The water from these cylinders is conducted into a common discharge main through which it may be delivered to any desired point.

HYDROCARBON LAMP.—No. 699,912. May 13, 1902. C. H. De Voll, Oakland, Cal. In this invention the hydrocarbon liquid is contained in a reservoir from which it is carried to a burner with intermediate mechanism by which the hydrocarbon is vaporized and air mixed with it. The liquid in the reservoir is subjected to air under pressure so that a pipe extending from the bottom of the reservoir upward to a point above the burner will conduct the liquid, and as this pipe is carried across the burner chimney and filled with wire gauze, the liquid is subdivided and vaporized during its passage. It is discharged through a nozzle which is so disposed with relation to closing caps that a sufficient amount of air is drawn in and mixed with the vapor on its way to the burner.

CARBURETER.—No. 699,830. May 13, 1902. Daniel Best, San Leandro, Cal. This invention relates to apparatus for producing or generating vapor or gas from liquids containing the same. It comprises a closed casing having surfaces disposed within it over which the liquid is caused to flow; means for heating the interior of the casing and said surfaces so that the liquid flowing over them may be vaporized; a means for regulating the flow of the liquid through the apparatus and means for regulating the application of heat, introducing air to mix with the vapor and for superheating or drying the product before it leaves the apparatus.

ADJUSTABLE WINDOW SCREEN. — No. 790,362. May 20, 1902. Otto Niehaus, West Berkeley, Cal. This invention is designed for the screening of windows and similar like apertures. It comprises a flexible screening carried upon a spring roller, a casing upon which the roller is supported, means for attaching the casing in position on a window frame; a slot in the casing through which the screening is drawn, and means upon the opposite side of the frame engaging the screen, with adjustable lateral guides, and means for adjusting the tension of the spring in the roller so that the screen may be drawn across the window when opened or allowed to roll up within its containing casing.

BICYCLE BRAKE.—No. 700,350. May 20, 1902. A. Main, Powelton, Cal. In this brake for bicycles a rim independent of and interior to the felly of the wheel is secured and the brake shoe operates against this rim, engaging the latter at about right angles with the axis of the machine. The brake shoe is operated by a system of bell crank and hand levers with intermediate connecting rods, so that it may be pressed against the supplemental rim with any desired power, and thus check or stop the machine.

COMBINATION BIT AND REAMER.—No. 700,430. May 20, 1902. G. A. Lane, Lakeside, Cal. One-half assigned to J. S. Martin of same place. This device is especially adapted to well boring and is designed to remount the bore below the casing and is so constructed that it can be withdrawn through the casing at any time. The body portion has its lower end inclined, the rear of this inclined portion forming a flat heel and the toe portion having oppositely beveled surfaces forming a cutting edge which is adapted to project out below the bottom of the casing and be operated to enlarge the hole.

CONVEYING APPARATUS.—No. 700,321. May 20, 1902. F. R. French, San Francisco, Cal. This invention relates to an apparatus designed for transporting burdens in both horizontal and vertical directions, and comprises parallel suspended cables enclosing an area and adapted to operate between four supports. A transverse burden carrier is movable between these supports and it is also movable transversely between the cables and at any point between the supports so that the burden can be transferred to any point within the area and raised or lowered without an independent main fall line. The whole mechanism is operated by an engine conveniently situated at one end and to which the operated cables are connected.

WRENCH.—No. 700,359. May 20, 1902. J. D. McFarland Jr., San Francisco, Cal. One-half assigned to J. Bruckman of same place. This wrench is designed to be operated in small compass and to have a wide wrench for different sizes of pipe, the operation being carried on without re-engaging the object at each movement of the handle. The wrench has an enlarged head with a circular revoluble jaw set in the head and comprising members rotatable independently of each other. The jaw openings in said members are adapted to coincide, and means are provided for rotating one of the members to contract the jaw opening.

BRAKE AND BELL FOR VEHICLE.—No 700,349. May 20, 1902. S. H. Madsen, Haywards, Cal. This invention is designed to provide a combined brake and bell mechanism to be applied to vehicles and especially to bicycles. The brake consists of a roller journaled between forks, which fork is supported upon a plate on clamps secured to the head of the bicycle. The roller comprises a central inelastic core and an elastic sleeve surrounding it with metal bands upon the ends, and the elastic sleeve is provided with a spiral wrapping of cords to reduce the wear. A pressure plate has shoes adapted to press upon the metal end bands of the roll while a central cord-wound portion presses upon the tire. A spring acts to normally hold the shoes out of contact with the roller and a guided rod connects the plate with the brake lever so that the device may be operated. A bell is so located with relation to the brake roller that when the latter is brought into contact with the wheel tire or rim the revolution of the roller actuates the hammer of the bell and thus gives the warning.

Notice of Removal of Principal Place of Business of Corporation.

WHEREAS, at a special meeting duly called and noticed, of the Directors of the HASKELL GOLD MINING COMPANY, held at the office of Company in San Francisco, the 24th day of April, 1902, a resolution was duly adopted that the principal place of business of the Company be changed and removed from San Francisco, California, to the City of Auburn, County of Placer, State aforesaid, and that notice thereof be published at least once a week for three successive weeks in some newspaper published in the City and County of San Francisco; and

WHEREAS, at said meeting the consent in writing to said change and removal of Stockholders holding more than two-thirds of the capital stock of the company was obtained and filed in the office of the Company.

NOW THEREFORE, notice is hereby given that the HASKELL GOLD MINING COMPANY (a corporation organized and existing under and by virtue of the laws of the State of California) which has heretofore had its principal place of business at San Francisco, State of California, intends to change and remove its said principal place of business from the said City and County of San Francisco, State of California, to the City of Auburn, County of Placer, State of California.

HASKELL GOLD MINING COMPANY,
By HAROLD T. POWER, President.
By order of the Board of Directors.

DELINQUENT SALE NOTICE.

LITTLE STANDARD OIL COMPANY.—Location of principal place of business San Francisco, California; location of works, McKittrick District, Kern County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 8) levied on the 4th day of March, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
Geo. E. Whittaker, Truetee.....	5	5	$ 50
Edward McGarry.....109		333	33 30
Edward McGarry 129		423	42 30
W. A. C. Smith.....112		1,000	100 00
W. A. C. Smith.....124		213	21 30
W. A. C. Smith.....134		107	10 70
F. W. McNear.....118		215	21 50
W. B Donnelly..... 135		5	50
J. H. Spring, Truetee..... 126		1,262	126 20
J. H. Spring, Truetee.....127		1,262	126 20

And in accordance with law, and an order from the Board of Directors, made on the 4th day of March, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, Room 40, Chronicle Building, San Francisco, California, on MONDAY, the 12th day of May, 1902, at the hour of 2:30 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of sale.

R. L. CHENEY, Secretary.

Office—Room 40, Chronicle Building, San Francisco, California.

POSTPONEMENT.

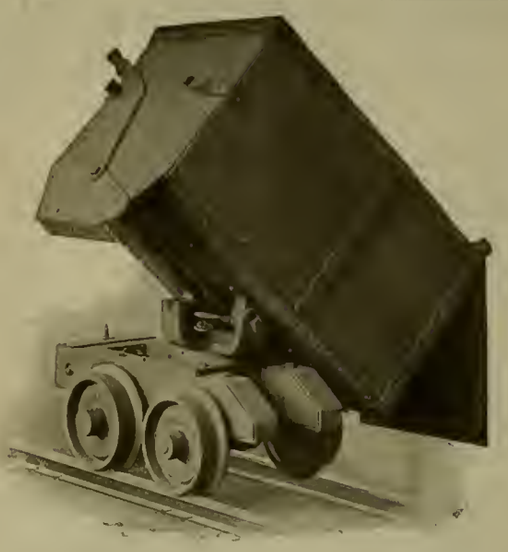
By order of the Board of Directors the day of sale of the above delinquent stock has been postponed to MONDAY, the 2nd day of June, 1902, at the same hour and place.

R. L. CHENEY, Secretary.

Office—Room 40, Chronicle Building, San Francisco, California.

HOWARD H. FIELDING,
Boston Building, DENVER, COLO.
Steam and Power Specialties
FOR ECONOMY.
IF YOU CANNOT FIND WHAT YOU WANT, WRITE ME.

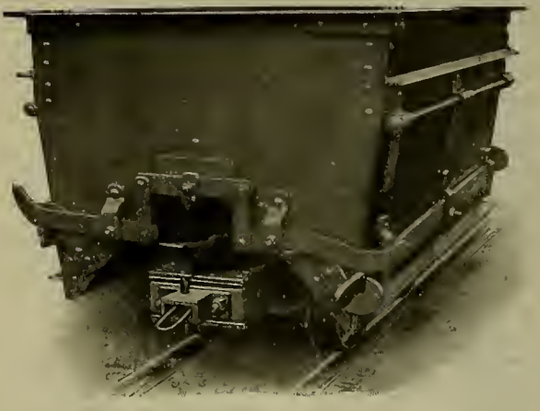
AMERICAN ENGINEERING WORKS,



No. 1 Standard Ore Car.

This car is now built with door hinge flush with top of car and rod protected by an angle.

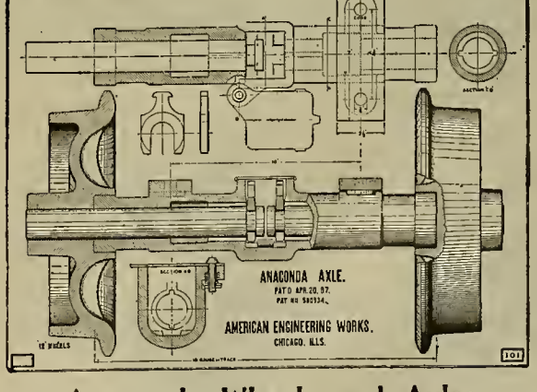
Capacity—16 cubic feet. Truck—Oak; body is supported by heavy malleable iron turntable resting on 4x6-inch oak truck timbers, heavily ironed and braced. Dumping side and end. Box—Inside dimensions, 44 in. long, 26 in. wide, 24 in. deep; bottom, 5/16 in. steel plate; sides and ends, 3/16 in. steel plates. Height—48 in. over all. Gauges from 18 to 24 in. Equipment—Anaconda wheels and axles. Weights—Car without wheels and axles, 690 lbs.; set of four 12-inch wheels, axles and sleeves for 18 in. gauge. 300 lbs; for 24 in. gauge, 350 lbs. Car complete, with wheels and axles for 18 in. gauge, 990 lbs.



No. 4 Gable Bottom Car.

This car is an excellent one for automatic operation. We can furnish it, if preferred, with Anaconda wheels and axles, and can make such variations in height and dimensions as will fit it for particular uses.

Capacity—50 cubic feet. Truck of steel beams. Discharge by releasing levers arranged for automatic operation. Body—Width inside, 50 in.; length inside, 66 in.; bottom, 3/8-inch steel plate; ends, 3/8-inch steel plate; doors, 5/16-inch steel plate; channels above doors. Height of car, 43¼ in. above track. Weight—Car complete, with wheels and axles, 2500 lbs. Size of wheels and gauge to meet requirements.



Anaconda Wheels and Axles

as made by the AMERICAN ENGINEERING WORKS are the best equipment for mining and ore cars in the market.

They pass curves easily, run easily and are economical of oil. There is not a piece of any kind to become loose or lost in service.

Over 5000 cars equipped with these axles are being used by the Anaconda Copper Mining Co., in Montana, and large numbers are in use in other mines in the Western States. Axles are made to suit any gauge from 18 in. to 48 in. Wheels of any type or size can be supplied. The wheels usually furnished are 12-inch in diameter, with chilled tread, of form as shown in cut. We always keep a number on hand for immediate shipment, and also keep all necessary parts for repairs.

2004 DEARBORN ST. CHICAGO, ILL.

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(—) Indicates every other week or monthly advertisements.

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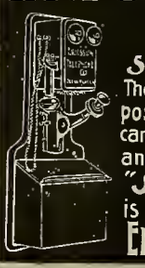

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ANNUAL MEETING.

The Regular Annual Meeting of the Stockholders of the National Cons. Mining Company will be held at the office of the company, 773 Mission St., San Francisco, California, on MONDAY, the 2nd day of June, 1902, at the hour of 8 o'clock P. M., for the purpose of electing a Board of Directors to serve for the ensuing year, and the transaction of such other business as may come before the meeting.

GEO. W. FLEISSNER, Secretary.
Office—773 Mission St., San Francisco, California.

THE CALIFORNIA DEBRIS COMMISSION, having received applications to mine by the hydraulic process from Sam Antye, in the Secret Diggings Mine, near Laporte, Plumas County, Cal., to deposit tailings in worked-out pit draining into Clark or Slate Creek, and from P. J. Sheridan and E. N. Ekel, in the Lancha Plana mine, at Lancha Plana, Amador County, Cal., to deposit tailings in worked-out pit draining into Mokelumne River, gives notice that a meeting will be held at Room 96, Flood Building, San Francisco, Cal., on June 16, 1902, at 1:30 P. M.

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Whole No. 2185.—VOLUME LXXXIV. Number 23. SAN FRANCISCO, CAL., SATURDAY, JUNE 7, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Mines and Metallurgy Building.

The Mines and Metallurgy Building at the forthcoming St. Louis Exposition forms part of the east wing of the ground plan of the show, and will be the last building on the south side of the avenue leading to the group of Government buildings. As part of the general scheme, it is not an important role. No attempt has been made to attract attention to it by towers or domes. The outside dimensions are 525x750 feet, divided into eight oblong parts almost equal in area by glass-covered and ventilated arcades from 30 to 50 feet wide, which makes possible abundant light from every side, no skylights being necessary directly over any of the exhibition spaces. At the intersection of the two principal arcades through the main axis a colonnaded rotunda is shown with an appropriate monument.

The ground floor will furnish an exhibition space of 250,000 square feet; 150,000 square feet may be gained by introduction of galleries. A sub-division of the exhibit space into numerous alcoves for each classification is suggested. The walls of the building are set back from the facade 20 feet, forming a covered loggia, which surrounds the entire building. The facade may be likened to a screen, bearing the same relation to the structure as do the colonnades of the adjoining buildings to their structures. The base of this screen consists of sculptured panels illustrating mining and metallurgical operations in symbolical representations, the background to the sculptured figures being of a rough, golden colored glass, which will be illuminated at night and show the figures in silhouette. The figures are more than life size. As a building for housing Exposition exhibits, it was argued that it should express externally as much friendly dignity as would be compatible with its brief existence; that it would be incongruous, however, to disguise its ephemeral character by the garb of severe and classic forms which are associated with the most lasting architectural monuments of antiquity; and that, furthermore, it undoubtedly should be novel, striking and full of life.

The postponement of the Fair one year will give better opportunity for proper mineral exhibits from the various States, giving a good chance for a fine showing. This paper suggests that an argument for the need of a Department of Mines and Mining could be thus made, besides securing a good advertisement of the country's mineral resources.

Mines and Metallurgy Building, St. Louis Exposition, 1904.

THE law will not hold the locator of a mining claim to a strict and technical observance of the statute in respect to the terms of his notice, so long as he substantially complies with its requirements, and if it appears that the location was made in good faith, and by any reasonable construction, in view of the surrounding circumstances, the language employed in the description will impart notice to subsequent locators, it is sufficient.

THAT the incorrect surveys made by careless and incompetent surveyors has been the source of confusion and litigation is well known. Much of such sectionizing and subdivision work is grossly inaccurate. Throughout many township and section corners are inaccurately located in some cases 500 and 600 feet from their true position. A resurvey in some cases by the Federal Government to establish missing, important corners would do much toward settling disputes; but this is difficult to obtain. This condition has come about largely through incompetence and in some cases where the actual work was not performed, but returns made thereof. While a majority of the U. S. deputy surveyors and many of the county and other surveyors are qualified for the work, yet there are many others whose bungling work is a disgrace to the calling and a source of much subsequent trouble. It would seem that State laws prohibiting the practice of engineering or surveying by incompetent persons, and requiring all surveyors to pass an examination and obtain a certificate from a State Board of Examiners, would do much toward remedying the evil.

SILVER contained in lead is easily freed and utilized. When the melted lead is mixed with zinc the silver forms an alloy and floats to the surface. When this mass is taken from the lead and heated in a retort, the zinc, being volatile, is freed and leaves a deposit so rich in silver that it is easily purified.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

Chicago Office.....737 Monadnock Blk.
Denver Office.....606 Mack Blk.

J. F. HALLORAN..... Publisher.

San Francisco, June 7, 1902.

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IT is not fair to broadly state that a mining property which will not give net profit earnings is worthless. Were that accepted, literally, no mine or prospect not in pay would have any value—which is absurd.

WHAT the scientific man does to-day the manufacturer will do to-morrow. The laboratory experiment of to-day is the mining or metallurgical or manufacturing process of to-morrow. Science is simply organized common sense.

THE large dividends of the Standard Oil Company have attracted such attention that many conceive it to be the choicest of investments. When, however, a comparison is made between them and the dividends of some of the great producing mines, it will be seen that the mining industry possesses some attractive features, and that a well managed mining property is a profitable investment. The dividends of Standard Oil have been to date $49,485,000. The Calumet and Hecla, in Michigan, have paid to date $78,850,000; Amalgamated Copper, $18,117,800; the Ontario of Utah, $14,827,000; Homestake, South Dakota, $11,178,750. These are dividends from but four mining concerns. Many more examples might be offered, but these are sufficient to show that mining offers greater inducements to investment than any other business, and that the profits from a low-grade mine, operated on a large scale with business methods, whether gold, iron, silver, lead, copper or coal, are greater than those of any other business enterprise, and have made more millionaires.

THE Schilz process of gold extraction is based on the action of finely divided gold decomposing barium-peroxide, liberating the oxygen in nascent state, the powdered peroxide being intimately mixed in dry state with the ore so that each particle of gold shall come in contact with a particle of peroxide. The materials are mixed previous to applying the cyanide solution. The peroxide is decomposed by contact with the gold, the free gold dissolved, the pyrites oxidized to iron sulphate and the gold therein dissolved by the cyanide. The finer the ore the better the decomposition and the easier the oxidation of the pyrites, to liberate the gold. The use of the barium-perchloride is designed to do away with lime, and to render the pulp more porous, the liberation of the oxygen causing the pulp to swell and become spongy. The process has been successfully used: a gain of 13% in extraction being reported as obtained by the employment of the barium-perchloride, of which one-third to one-quarter pound per ton is consumed. The manipulation is carried on without heat, cold solutions only being used.

A Case of Supply and Demand.

The demand for producing mines is in excess of the supply. The interest in mining is growing. Mines that a few years ago could have been purchased for less than their value are not in the market to-day at any price. There are exceptions, but this is the rule. The owner of such a mine by holding it gets the advantage of its prospective value, while its present earnings will care for his investment handsomely. Why should he sell unless he gets a proper compensation for the prospective valuation of his mine? While this is true as to mines, it is also true that thousands of good prospects are awaiting the helping hand of capital. Mines are made, not found. It takes a modest fortune to equip a first-class mine. It costs a large sum of money to open up a mine to the extent that it may produce a tonnage which will employ its plant. In most instances the men who own the big mines to-day were poor men a few years ago. They have become wealthy by making mines of their prospects, and in most instances they have brought wealth to those who assisted in the operation. These are the great opportunities of to-day. They present greater possibilities than investment in producing mines. They exist in great numbers. The most of the great fortunes which will be made in mining during the years to come will be through such investments.

Regarding "foreign" investments in mining, it would be a good thing for this whole Western country if the sentiment of the investing public changed to a more favorable view of prospective mining where investments are made for the development of properties that otherwise would lie idle. There is nothing to be gained by a mere transfer of title from a local to a foreign company in the case of a developed and producing mine, except where the purchase money is subsequently reinvested in local enterprises. The great benefit to local interests comes when foreign capital is employed in developing prospects into mines. This is also the form of investment which, when successful, yields the largest profits. True, there is greater risk about it, and foreign—and for that matter domestic—capitalists hesitate to embark upon such ventures. It is difficult to place them in markets far removed from the locality of the prospects to be developed. It is difficult to make men believe it reasonable and safe to invest their money in the development of properties that may or may not contain mineral in paying quantities.

Yet, the safest form of a mining investment for a man who knows what he is doing is that of a prospect sufficiently developed to disclose the presence of pay ore. The purchase price of such a property is small in comparison with that of a dividend paying mine. The purchaser of a developed mine has to pay the owner a big price, for the latter is under no obligation to give his property away. Subsequently the new owner must extract from the mine enough ore to repay him the purchase price before he can begin to count on profits. The more extensively a mine is worked after it has been opened up the less becomes its value, and the purchaser of a developed mine may see his ore bodies exhausted before he has repaid himself the purchase price.

The situation is manifestly different in case of a prospect. There the purchaser has practically everything before him, and it takes him but a little while, if the property is really good, to extract enough ore to cover the few thousand dollars which constitute the purchase price.

It has been suggested that a way in which local capitalists could co-operate with foreign investors in the development of the mineral resources of the country is for the former to bring numerous prospects to a stage of development which would disclose their value while not making them fully developed mines. This might be done. Local capitalists would incur comparatively little risk, because they could give every prospect a careful examination. They could obtain a good profit upon their venture from sales to foreign investors, and the latter, by carrying development still further, would give employment to additional labor and place many new mines upon a producing basis.

The objections to this idea will so readily occur to the mind of every intelligent reader as to make discussion unnecessary.

The fact is that the men who made the most money in mining in this country did so by making the mines, for mines are "made." They used judgment, bought prospects, developed them, stayed with them, backed their judgment and won. Foreign investors prefer a "going" mine. That is the fashion, but fashions change.

"Export Trade."

Much is at present being said and sung to American manufacturers of mining machinery about "export trade," and in some instances the thing "is being worked for all it is worth." There is a suggestion of humbug about some of the efforts made to induce our manufacturers to go after the export trade, and an apparent forgetfulness on the part of some inducers of the greater value of the home trade. To American manufacturers, however, who want to compete for this much vaunted "export trade," a few homely hints may not be out of place. The success commensurate with merit that marks the production of the American manufacturer and the marked superiority of his manufactures makes it sometimes difficult for him to understand that foreign customers can not be secured without deference and reference to foreign ways, and that foreign customs must be catered to if foreign demand is expected to follow foreign advertising. The catalogues and trade treatises of the American manufacturer are the finest things of the kind in existence; the plated paper, the costly engravings, the elaborately illuminated covers, and the fine technical descriptions of the machinery offered for sale are recognized and valued in this country or wherever people do their thinking or their reading in the English language, but however elaborate and expensive such a catalogue may be it is a failure as a trade producer in a foreign country where those who see it are not familiar with weights, measures and values when expressed in pounds, feet and dollars. The writer has seen a superb catalogue which was printed in German, an exact translation of the American edition, intended for German use, but forgetful of the fact that the metric system and the German currency terms to one that is accustomed to use them make the dollars and inches of the American catalogue look strange even though the text appear in German characters. Then, again, foreign purchasers are just as set in their ways as the rest of mankind, and while it is patriotic and praiseworthy to attempt to educate them, yet the more immediately profitable way is to give them what they want, and in the way they want it. Hence it were unwise to fail in attention to detail in these catalogues: the exact weight, dimensions, capacity, and cost in marks or francs or other foreign currency, of the machinery should be set forth; the commercial traveler should understand the language of the country and be able to clearly explain everything in connection with what he proposes to sell, and not be too insistent on rigid compliance with all American business customs. Foreign customs are as sacred to those who observe them as ours are to us, and what might be thoroughly understood as between Chicago and San Francisco might arouse ill will and create grave misunderstanding as between Chicago and Havre, or Denver and Seoul. Above all everything must be precisely as represented; any other course causes a serious setback to any foreign trade in American machinery and the manner of packing and mode of delivery must be throughout more in accordance with foreign requirements than any American idea, however superior such idea may be. Some of these requirements may appear unnecessary and even ridiculous, but if one plays any game he must observe the rules, and the buyer in any land usually has most to say as to what these rules shall be.

THE man who needs medical or legal advice expects to pay for either, and yet this same type of man will often ask a mining or electrical engineer questions that require equal technical knowledge for correct answer. The engineer's education has been a costly one and it often constitutes his stock-in-trade. Consultation and advice should rightly be charged in the case of the engineer as in that of the doctor or lawyer, and while it is to be noted that advice is usually worth just what it costs, yet in the case cited, it is usual to give advice or information that is worthy of a substantial fee.

Concentrates.

THE present London price of niter is $1.75 per 100 pounds.

THE lift of a sipbon at sea level will not exceod in practice 24 feet.

MANY think that M. E. is the proper abbreviation for mechanical engineer and E. M. for engineer of mines.

LIQUEFIED AIR, when used for motive power purposes, producos about 5% of the force spent in producing it.

THE freigbt on a pole 25 feet long, 6 inches in diameter at tbe top, from Idabo to Chicago common points, is $1.80; on 35-foot 7-inch poles, $4.25.

CONSIDERABLE manganese is mined noar Santiago, Cuba, where "miners'" wages are 75 cents per day. The mine costs per ton aggregate about $2.

ALL logs cut on public land in British Columbia must be made into timber in tbe Province. If thls is not done lt may be seized and forfeited to the Government.

AT the sea level and a temperature of 32° F. one pound of dry air occuples a space of 12.386 cubic feet. At 60° F. the volume increases to 13.089 cubic feet per pound.

SOFT carbonate or cerussite is carbonic acid lead oxlde, a lead carbonate, lustrous and fusible. Hard carbonato is largely oxlde of iron with a little soft carbonate therein.

CAST IRON, STEEL, PLATINUM, BRASS AND WROUGHT IRON become cherry red at 1400° F. Cast iron melts at 2250° F.; steel, 2500°; platinum, 3500°; brass, 1500°; wrought iron, 2700°.

PNEUMATIC DRILLS range in weight from 14 to 35 pounds, and drill from ¼ to 2 inches with from 3 to 4 inches feed, requiring pressures from 80 to 100 pounds, using from 20 to 45 cubic feet of free air per mlnute.

THE English mile is 5280 feet, the nautical mile 6085 feet, Scotch mlle 5928 feet, Irish mile 6720 feet, German mile 24,318 feet, the Dutch and Prussian mile 18,440 feet, the Swedish mile 22,043 feet, the Vienna post mile 26,388 feet.

EIGHTEEN-CARAT GOLD has eighteen parts pure gold, three parts copper and three parts silver in its composition; twelve-carat gold is half gold, the rest made up of three and one-half parts silver and eight and one-half parts copper.

CADMIUM can be produced in quantities far exceeding the demand, which is limited, and the discovery of cadmium ore is not of much commercial importance. Silesia supplies cadmium cheaper than it can be furnished from domestic sources.

WITH a large quantity of water and a small head, the turbine class of water wheel might be used with good effect. Where there is a small amount of available water but a large head, the tangential or impulse wheel could be recommeuded.

CANNEL COAL is a hard, even-grained coal, which can be cut lnto blocks and strips, and will burn with a clear yellow flame; when first known, it was used as a substitute for candles; hence the name "cannel," a corruption of "candle" coal.

A WIRE with a tensile strength of 2000 pounds will weigh per mile 270 pounds. It would be possible to so adjust the catenary curve that the supports for such a wire could be 1 mile apart in such an extreme case as the crossing of a river.

CHARCOAL has been used with a fair degree of success ln a copper matte smelter, though it is not the ideal fuel for that purpose. Hard wood charcoal goes to pieces in the furnace, nut pine being better, though coke is generally deemed more desirable.

THE composition of typical anodes of refined blister copper is as follows: 99.25% copper, 0.338% silver, 0.001% gold, 0.3% oxygen, 0.054% antimony, 0.033% arsenic, 0.009% lead, 0.008% selenium and tellurium, 0.002% bismuth, 0.002% nickel, and a trace of iron.

THE mesh in wire cloth is the distance from the center to center of wire. It is the number of openings in a linear inch, measuring from center to center; 40 mesh would be wire No. 31, the diameter of the wire being .0132 inch and the diameter of the aperture .0118 inch.

FOR FILLING IN around the new mortar blocks, pulp from the battery containing a medium percentage of sulphurets is good material. But in using any materlal for tamping, the filling should be allowed to remain quiet for several days, that cementation may be established.

SODIUM AMALGAM is of common use, and for coalescing floured quicksilver phosphate of sodium may be used with good effect. An occasional pinch of it on the quicksilver assists in amalgamation. It forms no combination with quicksilver such as metallic sodium does.

PLATINUM MONEY was coined in Russia from 1828 to 1845, but, so far as "Concentrates" knows, it is not used anywhere for that purpose. Russia, New South Wales and the United States are the principal platinum-producing countries, its commercial production in this country being entirely confined to the Pacific coast.

THE low wages paid Mexicans in Mexico is deceptive. The Mexican accomplishes far less work than the American laborer, and as a result the cost of the work performed is about three times what it could be done for by American labor. A Mexican bricklayer will lay 200 to 300 bricks per day, while the American mason will lay 2000 to 2500 bricks. Tho former requires two tenders, while one American tender will attend to two American bricklayers.

A SERVICEABLE cold cutter may be mado of worn-out large three-cornered files. Draw the temper, break the file lnto 3-inch lengths. Lay the file on the anvil, place the article to be cut upon lt; striking with heavy hammer will cut nearly through; turn over and a light blow will finish the cut.

HONESTY in the promotion of any mine enterprise requires proof of the existence of a mine. Often the public dispense with tbis proof and gamble on a few samples and an assayer's certificate, so that the stock in trade of some promoters is not the value of the mine, but the credulity of people with money in their pockets.

THE Colorado Zinc Co. has a 100-ton plant near Denver, Colo., that successfully and profitably handles zinc-lead ore, the zinc, lead and magnetic iron being separated and rendered suitable for smelting. The ore comes from Leadville, and the concentrates that result from the automatic handling in the Denver plant are sent to Mineral Point, Wis., for smelting.

THE pressure of still water against a wall or dam is the same, whether the water extends 1 foot or 1 mile from the wall. The pressure in pounds against any vertical wall may be ascertained as follows: Multiply together the area in square feet of that portion of the wall in contact with the water, half the vertical depth of the water and the constant 62.5 pounds (the weight of 1 cubic foot of fresh water); tbis will give the total pressure which is always vertical to the upper or wetted surface.

IN the case where plaintiff in an action to quiet title to mineral land claims exclusive adverse possession from the date of his location, and the evidence shows that defendant had purchased an interest from prior locators, and had continued in possession with them until they leased it to a third party for a term of years, which expired after plaintiff's entry, the lease is competent evidence to show that defendant was in possession by his lessee when plaintiff was claiming exclusive possession.

A FISSURE VEIN may in general be regarded as a mineral mass, tabular in form, as a whole, though frequently irregular in detail, occupying or accompanying a fracture or a set of fractures in tbe enclosing rock. This mineral mass has been formed later than the country rock, and the fracture either through the filling of open spaces along the latter or through chemical alteration of the adjoining rocks. Such alteration does not, ordinarily, extend far from the fissure. There is no difference between a "fissure" and a "true fissure."

THE contract calls for 3556 squares of slate. In each square there are 100 square feet of slate—158⅜ slabs, each 11 by 22 inches. Every square weighs 650 pounds; the entire lot will weigh 2,313,630 pounds. The total number of pieces will be 564,300; were they laid side by side and end to end, they would cover an area of 21¾ acres. Allowing a burden of fifty pounds to the man, it would require an army of 46,273 men to carry them. If this army marched in single file and with intervals of 3 feet, the last straggler would be 26¼ miles behind the drum major.

GOLD AND SILVER ORES are often found abundantly in the immediate region of porphyry dikes. One commonly accepted theory is that the dynamic disturbances accompanying the formation of the dikes shattered and fractured the rock crust of the earth to great depths, and furnished deep fissures, cracks or fractures through which ascending metal-bearing waters, from which the metals were deposited, could freely circulate, these dynamic disturbances producing the structural conditions or deep fractures as a course for circulating waters.

IN the "mixing tank" system on a gold dredger the plant consists of a tank under a screen about 20 feet long, with two partitions beginning at both ends and inclined toward the center, forming a chute, which carries the water, sand, etc. Having passed the screen from each end to the center, the material drops into the well or tank. The sides of the tank near the bottom, being oval-shaped, cause a boiling and whirling motion in the water, which mixes the water, sand and gold. At a given distance from the bottom an overflow is arranged to draw off the mixture onto the tables. This is for fine gold.

A SIMILAR CASE to the one concerning which inquiry is received from White Hills, Ariz., was decided in the suit of the Empire M. & M. Co. vs. Tombstone M. & M. Co., and is found in 100 Fed. Rep., U. S., 910. In this case it was held that a single contract made by a corporation owning mining ground in a Territory by which it employs and agrees to pay a second party to exploit and develop the property does not constitute a carrying on of business in the Territory by the corporation, within the meaning of a statute requiring foreign corporations carrying on business within the Territory to file copies of their articles of incorporation, and providing that every act done by them prior to the filing thereof shall be void; and such statute does not affect the validity of the contract.

POTASSIUM CYANIDE can be regularly added to keep a solution steadily up to standard strength. At the cyanide plant of the Dexter G. M. Co. at Tuscarora, Nev., where the ore uniformly consumes 1½ pound cyanide per ton treated, an amount of cyanide equaling 1½ pound for each ton of ore in a tank newly charged and ready for its first wetting witb solution is placed in a perforated tin tray 24 inches square and 6 inches deep. This tray with its charge is placed on top of the ore charge and under the pipe that admits the solution, the flow being regulated so that the ore is submerged just when all tbe cyanide is dissolved. This allows for varying amounts of moisture that may bo retained in the sands, insuring a full strength of solution when the leaching begins. In this way the strength of stock solution is held uniform, varying only a few points from month to month.

IN determination of copper by aluminum foil, the copper is brought into solution as a sulpbate, the solution evaporated until free from nitric acid. Dilute witb 50 c. c. wator for each 10 c. c. sulpburic acid present. Add three pieces of sheet aluminum (25 gauge) 40 m. m. (1⅝ inches) square, with one corner turned up for convenience in bandling. Boil solution for five minutes and the copper will be precipitated. Instead of redissolving the deposited copper and titrating with oyanide solution, satisfactory results are obtained by washing the copper into a tarred Gooch crucible, giving a final wash with alcohol, burning off, drying and weighing as metallic copper, using only enough asbestos to produce a good filter. In washing with alcobol and burning, tbe same care is needed, as in the electrolytic metbod, that too much alcohol be not used.

IF a gold leaf be placed in a flask containing two or three ounces of water and a few grains of dissolved potassium cyanide, and a portion of the air be displaced by bromine vapor, the metal will be rapidly dissolved on shaking. Apparently the bromine displaces cyanogen, which, in the nascent condition, readily attacks the gold, while potassium bromate is formed. With an excess of bromine, potassium bromide and hydrocyanic acid are formed; but the loss of acid may be prevented by the addition of alkaline hydrates. The quantity of the cyanide required is less than in the ordinary process. The reagents should be added in the correct proportions, calculated after carefully assaying the ore. In use, the fine ore may be kept agitated, the requisite amount of bromine being admitted intermittently; or the solution may be caused to percolate through the ore in presence of bromine vapor; or air and bromine together may be blown through the ore in the leaching solution. The bromine may be recovered by concentrating the solution after it has passed the zinc boxes, and treating it with hydrochloric acid, the evolved bromine being condensed.

IT has been the common practice in setting the battery posts of a stamp mill to mortise the post in the streak sill, at a point opposite the end of tbe mortar block and between the front and back sills on which the "streak" rests, a space between supports of 4 feet to 5 feet. Notwithstanding a large cross section may be given to this streak sill, it is elastic under the weight and heavy blows of the stamps, and this point is one which often requires watching and attention, or jumping battery posts will result. As the tendency of mill construction practice is towards rigidity in all parts which it used to be considered necessary to cushion, it would seem good practice to make the battery posts as rigid as possible. A post the same size as the battery post should be set under the streak sill directly beneath the battery post, its lower end resting on the bottom of the excavation for mortar block, and the post wedged firmly in place. Where the mortar block is built up of planks, or where large timber is available, a shoulder may be made on the mortar block, on which the streak sill can be supported. Such a construction will afford a rigid foundation for the cam shaft. As was argued in favor of a rubber pad under the mortar, so it may be said that a cushion is required for the battery posts. As a fact, neither is required. Plane surfaces, square joints and snug, will give the best results.

AND now goes in great numbers the prospector, the avant courier of the miner, the promoter, the investor, the mining machinery man, the pioneer of mining industry. A prospector's life possesses the charm of always hoping to strike it big, and even should he not succeed he can enjoy himself as no city denizen can. The mountains are now delightful, and when one tires of prospecting he may try his hand at hunting or fishing. There is plenty of game to supply one with fresh meat all the time; the larger streams abound in fish, and the pure mountain air and water keep the prospector in the best of health. There is only one risk to run, and that is of accident, and so it is safer for two prospectors to go together, as a man may fall off some steep ledge and break a limb, while climbing around in search of croppings. Where two can agree for a whole season the prospector's life is the happiest one in existence. The successful prospector must be a man of intelligence and have at least a natural insight of the laws of geology. He must be able to judge on looking over the face of the country whether the formation is volcanic or alluvial; he must be a good guesser as to the pitch of a certain ledge, so as to know how far down the hill to start his tunnel, in order to crosscut; and he must never get tired or hungry. When he feels exhaustion or hunger coming on he must pitch his camp, unpack his horse and stake him out to grass. Then he can build a fire, cook some bacon, bread and coffee, and rest until he feels better. "Pocket hunting" is a fascinating occupation for some prospectors. The pocket hunter toils along the steep mountain sides, perhaps far from water, and carries a little in a can to wash a handful of dirt here and a handful tbere, following up colors until a pocket of decomposed quartz is found, which may yield several hundred dollars. The pocket hunter, however, is ordinarily fortunate who finds enough in one pocket to keep him going until he strikes the next.

The Production of Copper in the Boundary District, B. C.

By Dr. Albert R. Ledoux.

I may venture to generalize with the assertion that the ores of Phœnix camp are almost exclusively altered limestone. On the north side of the ravine which divides the town, the limestone cap is in place, massive and unaltered save by the pressure which has crystallized it, the outcrops of ore being largely at contacts between intrusive eruptive rocks and the body of the limestone. This is notably true of the outcrop at the Brooklyn mine, where the uplifting of the limestone by the intrusive igneous rock is very marked, and along the vertical crushing zone there has been a second flow of pasty porphyry (using the general term) forming in the most interesting manner a breccia containing sharp, angular pieces of unaltered limestone and of the older porphyry. In the mines on the north side I am informed that the ore bodies exist in irregular masses of great size in unaltered lime, largely resembling caves which have been refilled with the ore-bearing material. The average ore of the best developed mine, showing nearly 500,000 tons in sight, is said to contain 38% of silica, 16% of oxide of iron, 15% of lime, and about 4½% of sulphur, copper 1.80%, besides gold and silver.

In all of these claims on the north side of the ravine the ore is frequently cut off unexpectedly hy vertical dikes or horizontal floors of porphyry in a way which would he the despair of those whose duty it is to develop the property, were it not for the great size of the bodies when found. On the south side of the gulch of Phœnix I venture to affirm that the mountain was originally divided by a strong dike of fine-grained felsite, which crops out boldly in the railroad cut where it crosses the Victoria claim, and is traceahle for 4000 feet to the south, crossing the Ætna and disappearing on the War Eagle. This dike has not been cross-fissured by any subsequent geologic action, so far as can be observed hy its appearance on the surface and at depths attained at present, or hy the result of exploration with the diamond drill which has penetrated it for several hundred feet at various depths and in different directions from the westerly side. It seems to me probable that on both sides of this main dike, which forms a sort of wall, and for 1000 feet or more to the east and to the west, the limestones originally overlying the granite, shattered by innumerahle disturbances and cross-fissured by secondary intrusions, have been mineralized and entirely altered by the solutions following up the main igneous dike and spreading, until nowhere that I could observe was the limestone left unaltered, so practically all of the original limestone that was not eroded has heen mineralized to greater or less extent. There is everywhere a notable quantity of calcite, a secondary redeposit of the lime.

To the east of the dike which divided the Phœnix hill the same general characteristics are noted which I have outlined ahove, being observed on the Gold Drop and Snow Shoe claims, and on the Monarch, except that on the Knoh hill, Ironsides, and other westerly claims there is a large, altered, oxidized zone, in which the copper is carried hy magnetic iron oxide, while on the easterly side the iron cap is not so extensive.

The Ore.—I have already stated that the ore of the mines on the north side of the gulch of Phœnix is said to contain on an average 38% of silica, 16% of oxide of iron, 15% of lime and 4½% of sulphur, there heing little change hetween the surface and lower ores so far as the chief constituents are concerned. This is about the composition of the lower ore from the south side, although many other conditions are distinctly different. The upper ores are largely oxidized and, as stated, consist of massive magnetic iron ore carryiug copper sulphide and gold; this surface ore changing at an average depth of perhaps 25 feet to ore more nearly resemhling that of the Brooklyn, the iron heing largely combined with sulphur, or sesquioxide, rather than in the higher oxidized form. By mixing these surface ores with those from lower levels an ideal mixture is ohtained, enahling the furnaces to produce directly a 45% to 50% copper matte, carrying practically all of the gold and silver which the ore contains.

I have said something about the characteristics of these ore deposits at or near Phœnix, but nothing concerning the quantity of ore which may he depended upon. Of course "available" ore depends on cost of treatment and price of its valuahle constituents. With adequate railroad freights and fair charges for coke it is prohahle that there are reasonably in sight in the Phœnix camp to-day several million tons of ore, which with copper at 12½ cents per pound could be treated successfully. In Deadwood camp the ore deposits are also enormous, averaging over 130 feet wide, and so situated that surface working can be prosecuted hy quarry, a single drill dislodging a train-load of ore in a day. But the prohlem of mining the lower levels of all these mines without excessive cost of timher or the permanent ahandonment of one-half or one-third of the ore, necessarily left in pillars, must be causing serious thought. The tonnage that can be extracted from the mother lode is also up in the high figures, and cheap smelting a welcome fact.

There have been numerous published guesses as to the grade of these Boundary Creek ores, and this after all is the vital point from which all the others depend. On the north side of the Phœnix ravine the large amount of ore developed is estimated to run ahout 1.80% copper, $2.40 per ton in gold, and 25 cents per ton in silver. The workahle ores from the south side of the Phœnix ravine contain on an average copper 1.70%, gold $1.60 and silver 33 cents per ton. The ore from the easterly side of the main dike, dividing the Phœnix camp, as represented hy the Snow Shoe, Gold Drop, etc., probably runs by the carload as shipped about 1.60% of copper, $1.50 in gold and 30 cents in silver. The run of the mines in the Greenwood camp, as shown by the smelter returns, is probably 1.60% of copper, $1.80 in gold, and 50 cents in silver.

It may, therefore, be taken as a safe estimate that the very large amount of ore available in the Boundary district will vary from twenty-five pounds to thirty-five pounds of copper per ton of 2000 pounds, with from 25 cents to 40 cents of silver per ton, and from $1.50 to $2.50 per ton in gold. It may be stated that there are some mines, like the "B. C." near Eholt, whose ores as shipped contain considerably more copper than the ahove, hut the figures I have given are well within the limits for the average.

Next to the quantity and grade of ore, the all-important question is how cheaply can the values from these Boundary ores be extracted and marketed.

It is easy to disprove the statement that only surface ores have been treated, because the records at the smelters show from what portion of the working, as well as from what particular claims, shipments were made. For instance, take the Knob Hill mine as an example. During the year 1901 there were mined:

From the surface	6%
From the 200-foot level	57%
From the 250-foot level	19%
From the 300-foot level	18%
	100%

Taking the Ironsides and Knob Hill together for the years 1900 and 1901, the figures show that 74% was from helow ground and 26% from surface ore, varying with the time of year. In the summer time a great deal more ore was taken from the surface workings than from beneath; in the winter time surface mining was largely interrupted. The cost of mining these large ore bodies in the Boundary has varied from $1.66 per ton, to $2.10 per ton, the first mentioned figure being the more recent. It is a difficult problem, as I have already hinted, and the one uncertain element in the prosperity of this district, how to handle the very large ore hodies without the risk of caving and ruining the mine, on the one hand, or the necessary employment of excessive amounts of timbering, or leaving in the mine large blocks of pay ore as a support. The management of the companies have been studying the problem and the Granby Co. have commenced ore handling with steam shovels, and propose to still further decrease the cost of mining hy stripping from the surface down to the present level of the railroad track, and by the introduction of the caving system for lower workings.

Smelting Costs.—It has been seen that cost of mining in the district, even with high wages to miners, is very low, the conditions heing most favorahle. I come now to the all-important statement of these smelting costs.

The Boundary ore being self-fluxing, indeed rather basic in character, allows the admixture of a certain quantity of siliceous ores from the Republic camp or other districts whose ores carry gold and silver, and the sulphur being low permits of smelting without preliminary roasting. It may also be stated that the freedom of the ores from hismuth, arsenic and antimony renders it easy to obtain a ready market for the copper product.

In considering the cost of smelting it is also necessary to take into account the losses in slag and otherwise. I was allowed to sample the slag dumps and to take portions of weekly slag samples which had heen preserved in the laboratory. Before the establishment of bessemerizing the slag loss of the Boundary smelters averaged copper .46%, gold 12 cents per ton, and silver 3 cents per ton. With a consumption of ahout 11% of coke, and with freight charges as they exist to-day the cost of smelting at the most favorable location in the Boundary district, after charging against the semlter the costs of marketing the product, must be considerably under $2 per ton. Adding the present cost of mining, the total outlay for mining and smelting must be less than $3.66 per ton.—Condensed from Canadian Mining Review.

A German engineering journal describes a double boiler, one within the other. The inner one holds the water, while the outer one is filled with oil. The heat applied to the latter heats the oil and indirectly the water in the inner hoiler. The advantage consists in the much higher hoiling point of oil, which permits of a higher temperature and thicker boiler plates without danger of injury to the metal.

The Cost of Cyaniding.

The following is a table of the costs at the various cyanide plants in the Black Hills, South Dakota:

Name of Mill.	Method in Use.	Remarks.	Tons Treated per Day.	Total Cost per Ton.
Spearfish	Dry coarse crushing.	.....	125	$0.80
Cleopatra	Dry coarse crushing.	.....	40	0.86
Wasp No. 2.	Dry coarse crushing.	.....	105	0.83
Golden Gate	Dry fine crushing.	.....	65	3.95 4.10
Portland	Wet crushing and slimes treatment.	.....	60–65	1.75* 2.00*
Dakota	Wet crushing and slimes treatment.	.....	60	1.50* 1.75*
Clevenger	.....	Cyaniding chlorination tailings.	30	0.85 0.90
Allen Bros. & Soule	.....	Cyaniding silver mill tailings.	35	2.50
Homestake	.....	Cyaniding stamp mill tailings.	1300	0.50*

* Figures with a star are not official, but are estimates, which, however, closely approach the actual cost.

It will be noticed that the cost at the mills treating coarse crushing ores is about the same—85 cents per ton. This cost will undoubtedly be somewhat reduced at the plants of larger capacity, as certain improvements with that end in view are contemplated. Most of the figures given do not include interest on plant, insurance or general office expenses. These added to the cost per ton will make it somewhat higher. The cost at the Golden Gate mill will be seen to be disproportionately high; in fact, the cost sheet gives the figure above $5 for some months. This high cost is due to the limited quantity of ore treated, the high rent, and the fact that the mill is old and poorly arranged, necessitating high repair cost and high labor cost. A modern mill, arranged for dry fine crushing, with a capacity of 100 to 150 tons of ore per day, should be able to treat oxidized ores for from $1.25 to $1.50, and ores which have to be roasted for from $1.90 to $2.25. The cost of roasting should not be high, as the hlue ores are light in sulphur, averaging perhaps 8%.

No detailed figures are available for the wet crushing mills, the total cost varying hetween $1.50 and $2 per ton. This figure is obtained hy mills having a comparatively small capacity (60 tons), and in a larger mill this cost could prohahly be reduced to in the neighborhood of $1.25 per ton.—Bulletin No. 5, South Dakota School of Mines.

Atomic Weights.

The committee appointed by the German Chemical Society, consisting of Messrs. Landolt, Ostwald and Seuhert, to determine the values of the atomic weights that should be employed for purposes of analysis or assaying, recommend that the atomic weight of oxygen should be taken as 16.00, and on this hasis the values of atomic weights of other elements should be calculated. The following values are recommended for adoption for the elements usually dealt with in metallurgical practice:

Aluminum	27.1	Manganese	55.0
Antimony	120.0	Mercury	200 3
Arsenic	75.0	Molybdenum	96.0
Barium	137.4	Nickel	58.7
Bismuth	208 5	Nitrogen	14.04
Boron	11.0	Oxygen	16.0
Bromine	79 9	Phosphorus	31 0
Calcium	40.0	Platinum	194 8
Carbon	12 0	Potassium	39 15
Chlorine	35 45	Silicon	28 4
Chromium	52.1	Silver	107 93
Cobalt	59.0	Sodium	23 05
Copper	63 6	Strontium	87 6
Fluorine	19 0	Sulphur	32 06
Gold	197 2	Tin	118 5
Hydrogen	1.01	Titanium	48 1
Iodine	126 85	Tungsten	184 0
Iron	56 0	Vanadium	51.2
Lead	206 9	Zinc	65 4
Magnesium	24 36		

There is a constant class of pirates lying around big mining camps who have no other aim in life than to watch applications for patent, trump up a case, get some tinhorn attorney to file an adverse and thensell out to the applicant for the best price they can get. These fellows discourage operators and frequently spoil sales, as capital is scary and will pull out of the field rather than risk a lawsuit. They are a nuisance. One way to treat them is to apply for a patent as soon as sufficient work is done and before the claim becomes so old that it is impossible to hunt down the invalidity of the adverse claim.

Costs and Profits in Pyritic Smelting of Low-Grade Copper Ores.

NUMBER IV.

Written for the MINING AND SCIENTIFIC PRESS by F. H. PRENTISS, E. M.

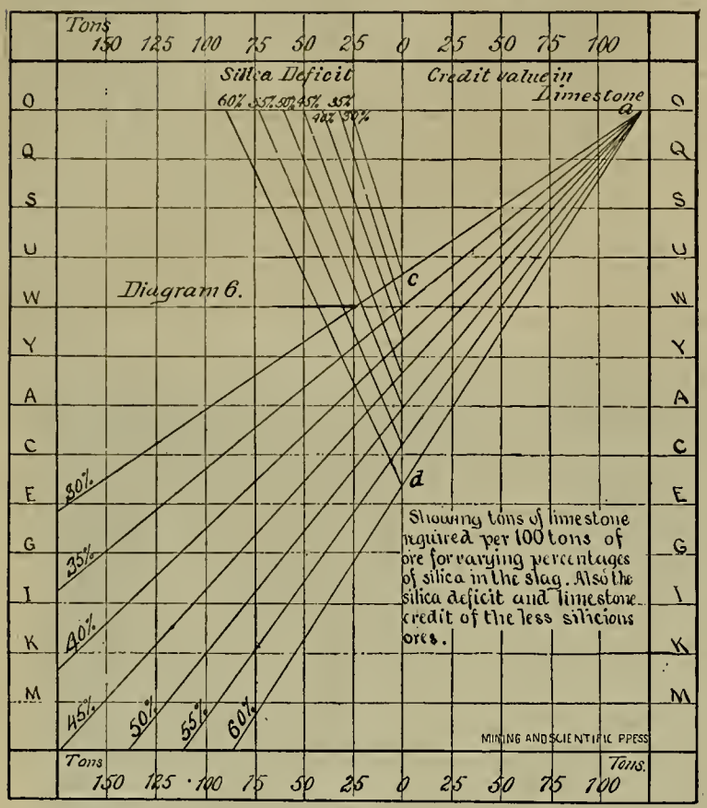
The use of limestone as a flux adds to smelting costs as follows:

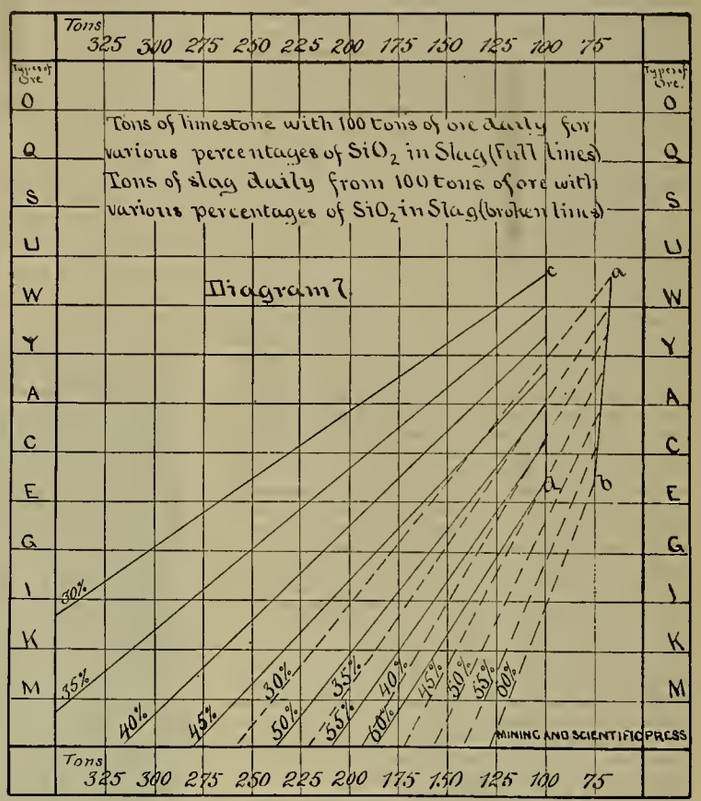
1st—Cost of the limestone itself.
2nd—Labor cost of handling it as flux.

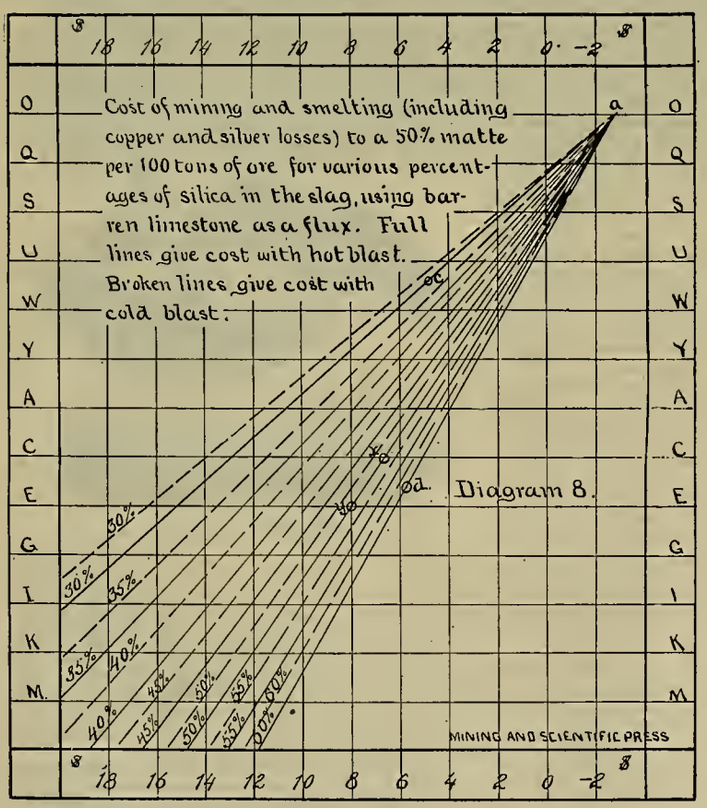
zero line we have for certain ores their credit value in tons of limestone for excess of bases they carry, and on the left of the zero line the same facts for the same ores are set forth as deficits of silica. For example, ore of type A is self-fluxing for a 50% silica slag, as shown by the intersection of the 50% slag lines and the type A line as the zero line. The same ore requires fifteen tons for a 45% slag, thirty-five tons for a 40% slag, sixty tons for a 35% slag and ninety-six tons for a 30% slag, while for a 55% and a 60% slag it shows a deficit of silica and a consequent limestone credit. In making a 50% SiO_2 slag the

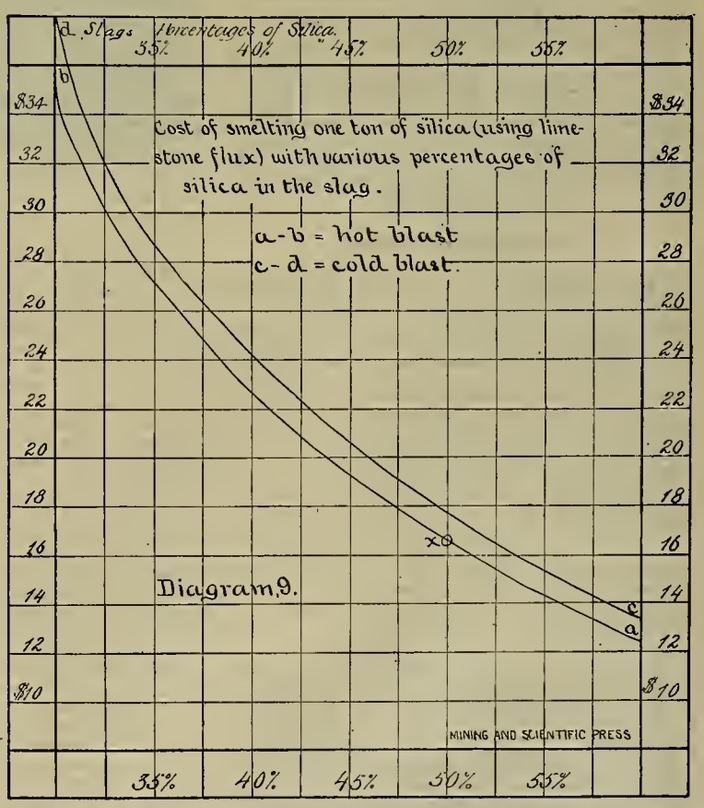
of mining and smelting various types of ores, using either hot or cold blast and making various types of slags. To mine and smelt, for example, an ore of type E, making a 50% SiO_2 slag would cost with hot blast $8 per ton and with cold blast $8 60 per ton, using a limestone flux, while for a 30% SiO_2 slag the costs would have been $15.20 and $16.40.

The line c d covers the range of self-fluxing ores and shows a cost from $4.80 to $5.80 as the slag varies in silica. Attention is again called to the fact that the lower cost accompanies the lower percentage of SiO_2 in the slag—just the reverse of what




Tons
325 300 275 250 225 200 175 150 125 100 75
Types of Ore.
Tons of limestone with 100 tons of ore daily for various percentages of SiO_2 in Slag (Full Lines)
Tons of slag daily from 100 tons of ore with various percentages of SiO_2 in Slag (broken lines)
Diagram 7.
c
a
b
30%
35%
40%
45%
50%
55%
60%
MINING AND SCIENTIFIC PRESS
Tons
325 300 275 250 225 200 175 150 125 100 75


$
18 16 14 12 10 8 6 4 2 0 -2
Cost of mining and smelting (including copper and silver losses) to a 50% matte per 100 tons of ore for various percentages of silica in the slag, using barren limestone as a flux. Full lines give cost with hot blast. Broken lines give cost with cold blast.
a
c
d
Diagram 8.
30%
35%
40%
45%
50%
55%
60%
MINING AND SCIENTIFIC PRESS


Slags Percentages of Silica.
35% 40% 45% 50% 55%
$34 32 30 28 26 24 22 20 18 16 14 12 $10
b
Cost of smelting one ton of silica (using limestone flux) with various percentages of silica in the slag.
a-b = hot blast
c-d = cold blast.
X
Diagram 9.
c
a
MINING AND SCIENTIFIC PRESS
35% 40% 45% 50% 55%

3rd—Labor cost of handling it as slag.
4th—Extra coke required in smelting.
5th—Extra blast and power required.
6th—Extra loss of values due to increased blast.
7th—Extra loss of values due to increased slag.
8th—Reduced capacity of the furnace for ore.

The lower the percentage of silica in the slag the greater the amount of limestone that will be required. Diagram No. 6 gives the amount of limestone required for various types of ore and of slag. From c to d we find self-fluxing ores for slags ranging from 30% SiO_2 to 60% SiO_2. On the right of the

slag produced per 100 tons of ore would be seventy-two tons, as shown in diagram No. 7, while for a 30% silica slag the amount of slag would run up to 120 tons. It will be noticed in diagram No. 7 the line a b ranges between an ore self-fluxing for a 30% slag and an ore self-fluxing for a 60% slag. Attention was drawn previously to the uniform conditions of power, blast, etc., where the ore was fluxed by means of concentrates, and it will here be seen that the weight of slag produced varies only from sixty-six tons to seventy-four tons between a 30% and a 60% slag. In diagram No. 8 we have the total cost

would have been the case if a limestone flux were used.

Type C ore shows on the diagram a cost for mining and smelting with hot blast and making a 50% SiO_2 slag of $6.70 per ton (marked X on the diagram). The same results may be had from the tables (which are for a 50% slag) by adding together columns 11, 17, 18 and 26, and adding to the sum the cost of mining ($2.42), the results showing as follows:

Column 11—Cost of limestone	$ 50
" 17—Combined cost of hot blast and coke	1 39
" 18—Cost of power, labor and supplies	1 35

Column 26—Loss of Cu and Ag in smelting	1 06
Mining cost ($2 25) and general expenses ($0.17)....	2 42
	$6 72

Such ore, therefore, if smelted under the conditions assumed must have a matting value of more than $6.70 per ton in order to show a profit. This is shown on diagram No. 1 where the line h a e (line of no profit or loss in smelting) intersects the horizontal line c c at a point giving a matting value of $6.70 per ton.

Diagram No. 7 gives the cost of smelting one ton of silica with different percentages of SiO_2 in the slag, the curve a h for hot blast and the curve c d for cold blast. These curves are built up from the data and diagrams preceding them and carry all of the variables that bear upon the cost of smelting. It will be remembered that our constants were cost of coke and fuel and cost of limestone. The curves give the debit side of the ore while the line c i (diagram No. 5) gives the credit side, and by combining the two we may at once determine what the smelting cost will be. The credit side of the ore is a constant and depends upon the ore itself, while the debit side is made up of several variables and the amount of debit depends upon how we select our variables, that is how we treat the ore.

Taking the conditions we have just been considering, a 50% SiO_2 slag and the hot blast (at 1000° F.), we see by diagram No. 9 that the cost of smelting a ton of quartz (marked X on the diagram) will be $16.65. Now ore of type C carries 42% of silica, and therefore we have a cost amounting to 42% of $16.65, or $7, to which we will add the mining cost, making $9.42. By diagram No. 5 we find that the full credit line c i intersects the horizontal c c at a point (marked X), showing a credit value of $2.75, deducting which from $9.42 leaves $6.67 as the cost of mining and smelting an ore of type C, an agreement with the results previously obtained. Diagram No. 9 also shows clearly the advantage and profit of carefully throwing out worthless quartz whenever any limestone flux is employed. Part of the removable quartz will go directly in large sizes to the waste dump from the conveyor belt, where the ore is hand sorted, and the balance as worthless tailings from jigs, and as fine tailings from the tables.

In the smelting of heavy sulphide ores, quartz, of course, is necessary and must be obtained and used for a flux just as limestone is used for siliceous ores. In nearly every case, however, the quartz is not merely a flux, but an ore which not only carries enough value to pay its way through the smelter but to leave as well a good profit behind.

The cost of roughly eliminating the larger sizes of worthless quartz and gangue in the process of sorting the ore into high grade (to smelter) and low grade (to mill) is practically nothing. The cost of running it through the smelter is very high, as shown by diagram No. 9 (depending upon cost of coke and limestone, for which items, treated as variables, other curves similar to those of diagram No. 9 may be constructed), while the cost of eliminating the excess of silica by wet methods depends chiefly upon the losses sustained in fine concentration.

(TO BE CONTINUED.)

The Statistics of Copper.

The statistical position of copper for the first four months of 1902 is thus set forth by John Stanton:

Four months.	1902.	1901.	Decrease.
U. S. production....	196,996,800	198,466,240	1,469,440
U. S. exports.....	151,536,000	67,475,520	*84,060,480
Home consumption..	45,460,800	130,990,720	85,529,920

Percentage decrease, 4 months 1902.....	0.75
Percentage exports of 4 months' product, 1902.....	76 00
Percentage exports of 4 months' product, 1901.....	34.00
Percentage U. S. product for home consumption, 4 months, 1902.....	24.00
Percentage U. S. product for home consumption, 4 months, 1901.....	66.00

*Increase.

Foreign mines increased their April output 1190 tons over March and 1359 tons over April, 1901. The April copper production of these foreign mines is the largest of any month in at least five years.

"I HAVEN'T time to read the paper and I haven't time to give what I suppose is the requisite amount of attention to my advertising." How often one hears that! Then take time. You have all the time there is. Do that which is the most important. To say you "haven't time" to attend to your advertising or to read your trade paper is another way of saying that there are other things you daily do that you consider of more importance. But there are not. You take "time" enough out of the twenty-four hours, that you have in common with everybody else, to eat and sleep. Take enough "time" from matters of secondary importance to tend to things of value; use time as a precious opportunity to read the trade paper, and give attention to your advertisement commensurate with its importance. His trade paper and his advertisement in it are the two things of greater importance to the business man than any other two items in his business. Take "time" to rightly attend to them. It will pay.

Cyaniding Sulphide Gold Ores.

The natural bisulphide of iron FeS_2 shows considerable difference towards cyanide. Apart from any admixtures, the kind of FeS which crystallizes in the rhombic system, the marcasite, is always attacked by cyanide to a considerable degree, though the isometric iron pyrites is not at all, or very little, acted upon. In one extreme case where FeS_2 was present mostly in the form of marcasite, cyanidation of a gold ore was made impossible, both on account of low extraction, as well as very high consumption of cyanide; while in numbers of cases, where pyrite only was present, the consumption of cyanide was hardly noticeable. It is plain that the substance of the dimorphous FeS_2 can not be the same in the two different forms—a fact which might already be implied from the different behavior of the two kinds towards the oxygen of the atmosphere. It is well known that marcasite rapidly oxidizes into a protosulphate of iron, while the cubic pyrite withstands the influence of the atmosphere much longer and then usually forms ferric sulphates and oxides, besides ferrous sulphate. A. P. Brown proves that there exists a chemical difference between pyrite and marcasite, and proves the cause of the difference. As the main result of his investigations, he could state the real formula of the pyrite to be $Fe_{II}Se_2Fe_{III_4}S_8$, while the marcasite experimented upon corresponded to the formula $Fe_{II}S_2$. In the marcasite the iron is in its bivalent form as ferrosum only, while in pyrite four-fifths of it is trivalent, is present as ferricum, and only one-fifth as ferrosum. The difference of KCN acting on $Fe_{II}S_2$ or $Fe_{III}S_2$ seems to correspond with the difference of action on $Fe_{II}O$ and $Fe_{III_2}O_3$; the first is easily soluble, while the latter is insoluble. It is likely that the proportion of one-fifth and four-fifths in the pyrite is not stationary, and that other combined proportions of the two substances occur, which will explain fully all the differences of solubility of FeS_2 in KCN.

Sulphide ores show pronounced differences in their behavior toward cyanide solution. Neither the same mineralogical character nor the same chemical composition as proven by analysis can be taken as guidance to foretell the actual behavior of natural sulphides toward cyanide solution. We have to experiment with the ore from every new locality before we are entitled to say if the decomposition of cyanide by the metallic sulphides will or will not allow the use of the cyanide process. To know that iron pyrite ores in nine different cases were only slightly acted upon by cyanide does not warrant our saying that in the tenth case the same action would result, nor are we entitled to state dogmatically that copper pyrites will always be acted on by cyanide to such a degree as to exclude cyanidation, because we know that this has been observed in a number of cases.

The main practical question in regard to cyanidation of sulphide ores is whether we have any means of obviating or removing the causes which otherwise prevent its application. Leaving out the simpler cases where a finer pulverization might better extraction, and also the possible case where gold is in insoluble compounds, the question is narrowed down as to how we can prevent cyanide from being decomposed by soluble sulphides. The answer can only be to turn them into insoluble sulphides or change their chemical composition into an indifferent compound. Even if the first condition be possible, we have at present no known means of achieving such a change, and therefore it may remain undiscussed.

Regarding the second proposition, a radical remedy is known, to turn soluble and insoluble sulphides into insoluble oxides by roasting them, and an intermediate stage would be roasting to sulphates and removing by water the soluble sulphates previous to cyanidation.

It is, of course, not impossible that a means could be discovered by which in a cheap and efficient way the soluble sulphides could only be removed previous to cyanidation, and where the harmless insoluble sulphides would remain unaltered. This would have to be a compound possessing very similar qualities to cyanide, but much cheaper. Strong bases, as caustic alkalies, which one might think fit to achieve the desired effect, will not answer.

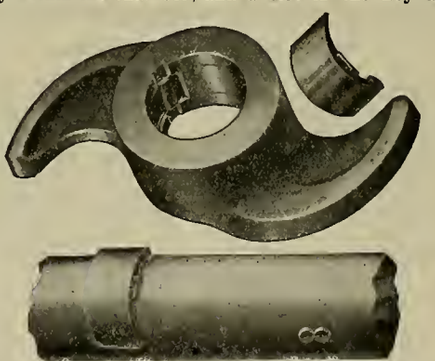
In some cases, where the consumption of cyanide was not too high to prevent cyanidation, and where also the percentage of extraction was satisfactory in the beginning, cyanidation had to be abandoned on account of a gradual falling off in extraction. One case came under observation where the percentage of extraction fell within a short time from 80% to about 30% of the value. It was apparent that this result was due to an accumulation of products of decomposition of sulphides and cyanide. With every new operation a fresh quantity of sulphide of potassium was formed, which, being a precipitant for the precious metals, gradually prevented their solution by cyanide. Soluble lead or zinc salts could be used in such instances to remove the sulphur from the working solutions by causing it to form an insoluble metallic sulphide.

The soluble sulphates could be easily removed by a water wash, and the considerable gain in time and saving of fuel over a dead roast would speak much in favor of such a method, and the inconvenience caused by the constant gaining in volume of working solution would not be such a serious drawback as to make the process impracticable. However, the fact is that, especially with sulphide ores, not concentrates, the complete oxidation of sulphides into sulphates is an ideal state, and the nearest approach to it is only gained in the course of a thorough dead roast. If roasting is interrupted when the bulk of the sulphides has been turned into sulphates, an appreciable amount of sulphides in the finest state of division, enclosed by gangue or sulphates and oxides, remains unaltered, and in the subsequent leaching by cyanide it will be found not only that the consumption of cyanide will be higher, but also that the percentage of extraction will not be as high as with dead-roasted ore. In one case, where the writer had changed from a dead-roasting to a roasting for sulphates, in order to increase the capacity of a mill and to reduce roasting expenses, he had to go back to a thorough roasting on account of the reason stated.

It seems to hold true that dead-roasted sulphide ores and concentrates are amenable to cyanidation, and that the consumption of cyanide is always low. If it were not for the reasons incidental to all roasting operations, cost of fuel and labor and partial loss of the precious metals, we would have in roasting and cyanidation a process which would be rapidly adopted with a great many ores which now remain unworked. Unlike the chlorination process, cyanidation of roasted ores is always cheap. As it is, cyanidation of roasted material will be the process of sulphide ores of lower grade than hitherto could be worked by chlorination, and, besides, be more economical with some kind of concentrates or sulphide ores worked hitherto by chlorination. What would be the lowest grade ore which could be treated in that way is impossible to say, depending, as it does, on local conditions. If the material is high grade enough to be treated either by chlorination or cyanidation, experiments will have to decide which process should be adopted. It seems that the extraction by chlorination is usually somewhat higher than by cyanidation, most likely because of the gaseous state and, therefore, greater penetrative power of the reagent. It will, therefore, depend on the relation between the difference in extraction and the difference in working expenses as to which process is the more economical, and, all other conditions being the same, it will be found that the lower grade sulphides now treated by chlorination are more adapted to cyanidation, whereas the higher grade concentrates will remain to be the especial domain of the chlorination process.

Canda Self-Locking Cam.

The illustration herewith is of the Canda self-locking cam for fastening cams to the cam shafts. The idea is to fit into the bore of the cam an eccentric wedge chamber formed by the continuous revolution of a boring tool, the chamber occupying only a part of the width of the hub of the cam, a circular wedge key within the chamber, and a slot in the key and



The Canda Self-Locking Cam.

the cam, to let the studs engage the wedge key and thus hold it in position. These cams are interchangeable; the fastening is self-tightening and the frictional adhesion between the shaft and the concentric face of the circular wedge is sufficiently great to keep the wedge practically in compression. The cams may be loosened by striking the arm a light blow on the reverse side. The cam can be readily adjusted to the ordinary cam shaft, by hand, or, if necessary, with a ratchet drill, after which the studs may be driven into place.

These cams are made by the Chrome Steel Works, Brooklyn, N. Y. Their Pacific coast representative is G. W. Myers, Hayward Bldg., San Francisco, Cal.

THE quantity of fine ore which can be smelted in the blast furnace is limited by its tendency to pass through the fuel, and therefore descend without being completely reduced. But it may be made into briquettes or turned into spongy iron. Briquettes made from fine ore cemented by quick or slacked lime, with water necessary to make a thick paste, harden sufficiently when dried in air. Ore coke is made by mixing fine ore with tar or bituminous coal, 30% of the latter to 70% of iron, and highly heating the whole, which yields a hard and compact product.

Mining Industry of Clear Creek Co., Colorado.

Many of the mines of this section, though profitable and developed on an extensive scale, are comparatively unknown. It is a district composed of individual mine owners and close mining corporations.

The almost universal stock proposition is unknown here, and so the district gets along quietly and conservatively, increasing in volume of shipments steadily and progressively.

The mines of the Con. Stanley Mining & Milling Co. have over 7 miles of underground work. The shaft of this property is over 1200 feet in depth, equipped with a perfect hoisting plant. This property has a record of production running into the millions, goes along in a steady routine of production and profit, giving constant employment to a large number of men. It is managed by James Bowden.

The Monarch tunnel, driving into the Freeland district, and the Central tunnel, on its way through Clear Creek county into Gilpin county, cut the veins of both sections at a depth varying from 1000 to 2000 feet.

The Sun and Moon mines, under the management of H. N. Sims, employ nearly 200 men in the various workings, with an average daily shipment of nearly 100 tons of ore. They are working both through the Newhouse tunnel and a shaft nearly 1000 feet in depth.

The John Owen Mining Co., under the management of Mr. Riley, is another example of perseverance and practical mining judgment. This property is a regular shipper of high and medium-grade ore.

The Gem and Gem Extension mines are heavy producers, getting out a large tonnage through their shaft and through the Newhouse tunnel, where this vein is cut at a depth of over 2000 feet. This property is under the management of W. E. Renshaw. Mr. Renshaw is also the organizer of the Seaton Mountain Electric Light, Heat & Power Co. and the manager of the same.

The Bertha Mining & Milling Co., under the management of M. W. Tanner, is being extensively developed.

The Seaton Mining & Milling Co. has one of the most extensively developed and thoroughly equipped properties on Seaton mountain. This part of the Idaho Springs mining district has been consecutively prospected, mined and developed for a period covering fifty years of uninterrupted work. The Seaton mine is now over 900 feet deep and work is progressing day and night. In the development of this property over 1000 tons per month are being extracted, no stoping being done in the extraction of this quantity of ore. When the present extensive work, as now outlined by F. S. Goldsmith, the manager of the property, is completed, it promises to be one of the heaviest producers of the camp. The mine is electrically equipped throughout and affords a good example of modern mining methods.

The Shafter mine, under the management of Mr. Roller, the Con. Franklin mine, under the management of Mr. Bane, the Joe Reynolds and the Tropic mines, owned, operated and managed by R. B. Morton, also come under the head of successful mining institutions.

The Lamartine mine, managed by Lafe Hanchett, is a continuous producer of high-grade ore in large and continuous quantities, with a crosscut tunnel, developed under an expense of more than half a million dollars. Mr. Hanchett is also the manager of the Newhouse tunnel enterprise.

The Freeland Extension mine, a close neighbor of the Lamartine property, under the supervision of W. A. Haggott, also comes under the head of our successful mining propositions.

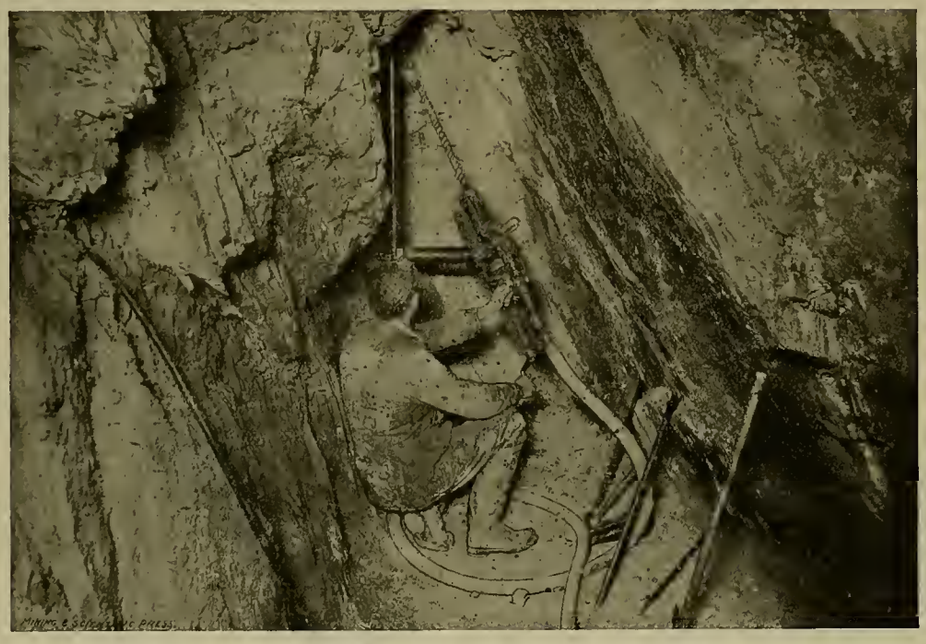
To mine in Clear Creek county means to produce ore, with our modern, up-to-date mills and with the constant improvement in the various methods of wet concentration. The accessibility of this district, being thoroughly equipped from a milling standpoint, within easy reach of a large city, with supply houses whose volume of business enables them to handle and sell their material at a low margin of profit, gives the miner and mine operator of Clear Creek county advantages not always within the reach of ordinary mining communities.

The Jackson, Newton, Silver Age Mills Nos. 1 and 2, the Mixsell and Allen mills, the combined concentrating and cyaniding plant of the American Gold Mining & Extraction Co., the Mattie and the Stanley mills are congested at all times with more ore than they can handle, showing without douht that, even with our enormous mining facilities, we are behind the ore production of the camp in point of milling capacity.

The ores of this district are auriferous and argentiferous galenas, the average value of the smelting product being about $50 per ton. On account of the high percentage of lead that these ores contain, the smelting charge is minimum, making a marketahle product the smelters must necessarily have. The ores of the camp carry from 5% to 15% copper and in most instances the gold values exceed the value of the silver. The veins of the district are fissures in granite.

COLORADO.

Idaho Springs, May 29.



Compressed Air Drill in Stope Sun and Moon Mine, Seaton Mountain, Idaho Springs, Colo.

THE electric furnace is, as a rule, only of commercial value in carrying out processes or producing results that can not be obtained in any other way. The enormous consumption and cost of horse power required for chemical work and the consumption of carbon electrodes are items of serious expense. There are, however, a number of instances in which it is of advantage to introduce the electric furnace to replace the ordinary means of bringing about chemical reactions that take place at high temperatures, since it not only shortens the time required for the reactions, and thus increases the yield for a given time, but the reactions in many cases take place much more completely. It also offers the additional advantage of placing the heat at the point required. The substitution of the electric furnace for the ordinary means of bringing about heat reactions is, as a rule, merely a problem of economic engineering.

IN a test of a new gasoline oil pumping plant at Austin, Texas, the contents of two full loaded oil cars were forced through the pipe from the railroad tracks to the asylum, 6700 feet, in two hours. Ten gallons of gasoline, costing $1.35, were used. Each car contained 3200 gallons. The building is on a hill, which made the work more difficult. One gallon of gasoline, costing 13½ cents, was used in moving 540 gallons (16 barrels) of oil more than 1¼ mile up hill. In addition, there was a saving as compared with the former system of drayage and a more expeditious and satisfactory handling of the oil.

Prehistoric Gold Mining.

Some glimpses of mining when the world was young are afforded by reports of ancient gold mining in Mashonaland, Matabeleland and Maricaland, British South Africa, where 330 miles of reefs lately located cover prehistoric workings. These workings are generally several hundred yards in extent and continuous on the surface. The depth attained rarely exceeds 100 feet, averaging 30 feet. When and by whom these ancient workings were made is a matter of uncertainty. That an enormous amount of gold has been obtained from these workings in the past is unquestionable. Millions of dollars worth of gold were derived from these sources. The methods of mining and the reduction of the ores were, of course, crude. Various theories have been advanced as to the causes of the discontinuance of mining upon the ancient workings. It has been asserted that the veins pinched out in depth, and were in consequence abandoned by the ancients. It is undouhtedly true that in some instances the veins did pinch, and that the ancients, like some of the moderns, ignorant of the fact that such pinching was but temporary in occurrence, abandoned the workings. The tendency to pinch and to open out is a characteristic feature of fissure veins. The fact that levels have been recently driven upon many of the veins below the ancient workings was due to the fact that the veins pinched out in depth. Irrespective of the geological evidence upon this point, controverting the theory of the pinching out of the veins in depth, is the demonstration of the continuance of the veins below the ancient workings. Though the theory of impoverishment in depth explains the abandonment of some of the workings, it has only a limited application. It is probable in many instances the ancients encountered in their exploitations poor zones, and, in consequence, abandoned the veins. The occurrence of poor zones is a characteristic feature of gold mining, and it is not unlikely that had the explorations been sufficiently extended richer zones would have been again encountered. The cessation of mining operations was doubtless ascribable to the incapacity of the miners to cope with the difficulties attending deep mining—increased hardness of the rock, influx of water, inadequate methods of timbering and retaining the ground, refractory condition of the ore and lack of metallurgical knowledge. Any one or all of these conditions might have obtained with the result that deeper mining would have been rendered impossible under the primitive methods in vogue. It is not improbable that these reefs have in most cases been worked at different periods.

Publications on Ore Deposits in Colorado.

The United States Geological Survey has recently published the following reports upon mining districts in Colorado: (1) A Report on the Economic Geology of the Silverton Quadrangle, Colorado. By F. L. Ransome. Bulletin No. 182. 258 pp., xvi plates and 23 text figures. The bulletin describes an area of about 250 square miles in the San Juan mountains, with particular reference to the geological relationships of the ore bodies, including those of the Camp Bird, Tomboy, Yankee Girl, Guston, Gold King, Silver Lake and Iowa mines. The ore deposits, which embrace lead, silver-lead, silver-copper and free-gold ores, are fully described and classified and their origins discussed. Special attention is given to variations in the ores with depth and to the causes of these changes. The memoir contains a chapter on the general geology by Mr. Whitman Cross. (2) The Ore Deposits of the Rico Mountains, Colorado. By F. L. Ransome. Extract from the Twenty-second Annual Report of the Survey, Part II, pp. 229–397, plates xxvi–xli (including map in pocket), text figures 39–71. This report contains full descriptions of the remarkable lode and blanket deposits of silver ores worked in the Enterprise and other well-known mines near Rico. The geological relations of these deposits are treated with abundant illustrations, the origin of the ores is discussed and the future of the district is considered. The above memoirs are obtainable on application until the supply is exhausted. All communications should be addressed to The Director, United States Geological Survey, Washington, D. C.

THE latest large California electric company is the Feather River Power Co., which has bought the property of the Big Bend Tunnel Co., on the Feather river. The idea is to dispense with the ordinary flumes, ditches, etc., and depend solely on the volume of water from the tunnel to generate power. The intention is to supply power to San Francisco. C. W. Howard is president and F. McLaughlin manager. They propose to spend $2,000,000 and have the works in operation in less than two years.

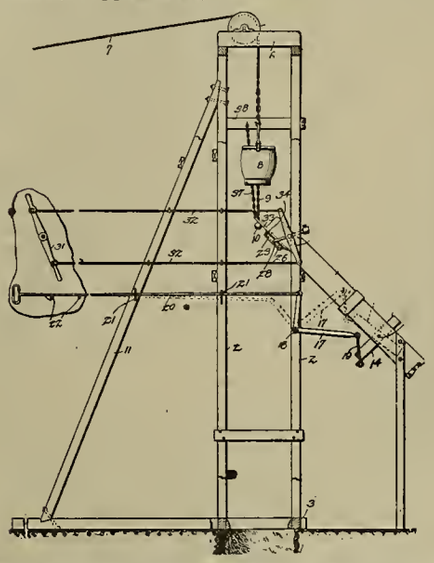
AT the annual dinner of the old students of the Royal School of Mines, London, Chairman McNeill stated: "Hennen Jennings told us that the figure of the total production of the Transvaal to date was some £80,000,000; but he estimated that the cyanide process had been responsible for 90% of the profits, and without that process very few of the Transvaal mines indeed could possibly have been made to pay."

Mining and Metallurgical Patents.

Patents Issued May 27, 1902.

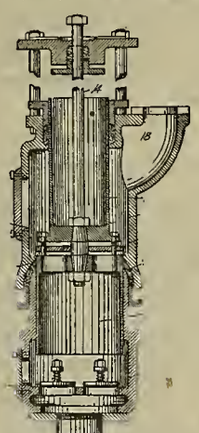
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

ORE BUCKET, DUMPER AND CHUTE.—No. 700,741; L. Collier, Cripple Creek, Colo.



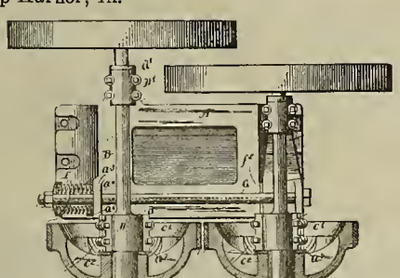
Tilting bucket raised, lowered therehy, chute, dump section pivotally mounted at upper end of chute, dump section and bucket having coacting means to tilt latter, dump contents into chute, rock shaft having crank connected to dump section, weighted arm to normally turn dump section out of path of bucket, means connecting dump section to fixed point, to limit play of dump section.

PUMP.—No. 700,936; A. E. Johnson, Victor, Colo.



Combination of cylinder composed of two overlapping. parts shaped to form cavity, inner portion curved communicates with cylinder chamber, outer extremity exposed, packing gland adapted to enter cavity hetween cylinder parts, plunger stem, hollow lower plunger connected with stem, plunger provided at upper extremity with valve seat having openings separated by ribs, closed upper plunger connected with valve stem, holts attached to upper plunger forming valve stems independent of plunger stem, valve composed of sections slidable vertically on stems, dividing lines hetween valve parts arranged to coincide with ribs of valve seat, to prevent leakage when valve is seated, upper part of cylinder provided with opening to permit access to mechanism for purpose of repairs, door detachahly connected with cylinder for closing opening.

ORE CRUSHER.—No. 701,001; R. H. Aiken, Winthrop Harhor, Ill.

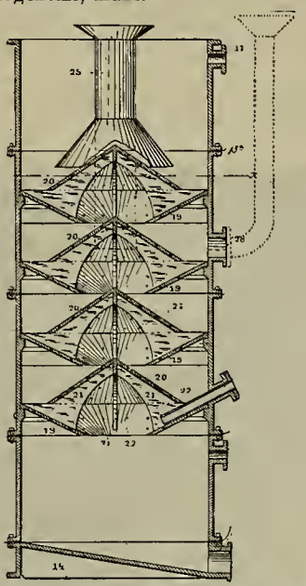


Ore crusher, comprising main frame, dished or recessed crushing rolls, shafts to which rolls are attached, hearing for one shaft mounted on main frame, hearing for other shaft movahle upon frame, means for yieldingly holding shafts and rolls in working relation to each other, working faces of rolls in alignment with hearings of shafts.

ORE CHUTE AND TRAP DOOR.—No. 700,789; J. A. Lindall and N. Mattson, Two Harbors, Minn.

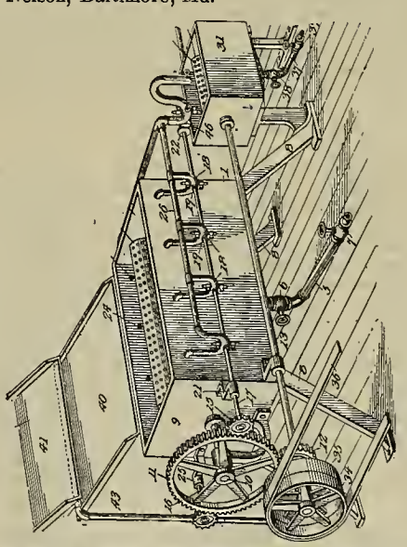
Regulating flow of ore or materials in transporting from one receptacle to another, combination two rods extending from top of pocket to lower end there secured, suitahle trap doors secured on rods, doors provided with projections, cog wheels secured on upper end of rods, cog wheels intermeshing, suitahle lever secured on one of rods, suitahle stopper to engage lever, smaller cog wheel intermeshing with one of main cog wheels secured on rods, smaller cog wheel actuated by lever.

APPARATUS FOR LIXIVIATING ORES.—No. 700,972; P. Naef, Argentine, Kans.



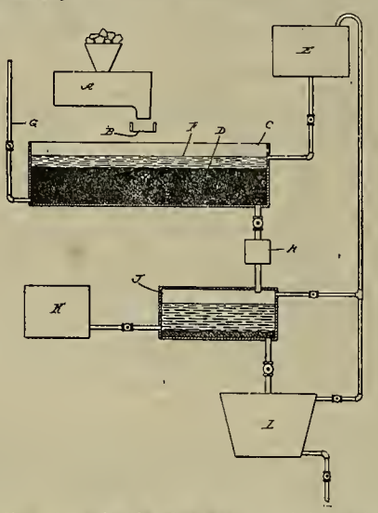
Lixiviating column having series of superimposed inclined surfaces, means for feeding ore at top, withdrawing sludge at hottom, inclined surfaces having numerous perforations to permit upward flow of gas, with inflow for liquor at hottom; its discharge at top, an air or gas injecting device admitting air or gas to column helow; perforated surfaces, wherehy there is down feed of ore over perforated inclined surfaces within leaching solution, and uprising of air or gas through perforations of inclined surfaces, and successive passage of same through layers of ore within leaching solution.

AMALGAMATOR.—No. 701,212; J. S. Marquette and P. J. Nelson, Baltimore, Md.



In an amalgamator combination with tank having converging bottom provided with central discharge opening, pipe communicating with opening provided with two independent valves, revoluhle main shaft extending through tank, perforated agitator hlades projecting from shaft, series of overflow traps communicating with rear side of tank, another series of overflow traps communicating with front side of tank, shaft extending through each series of traps carrying agitators within traps, means for revolving shafts from main shaft, pipes connecting all traps with discharge trap, inlet and outlet cocks for traps, auxiliary tank provided with agitator and discharge pipe having two independent valves.

PROCESS OF TREATING ORES.—No. 701,134; C. J. Best, Denver, Colo.



Grinding to suitahle fineness, supplying solution, consisting of large proportion of water, small proportion of acid and salt mixture, consisting approximately of two parts common salt, one and one-quarter parts niter, one and one-quarter parts alum, one and one-half parts nitric acid, hoiling whole for proper length of time, filtering solution, precipitating metallic portions by sulphureted hydrogen until sulphide precipitate is formed, heating precipitate with fluxes to drive off vapors, then drawing off metals.

STAMP STEM.—No. 701,077; W. S. McKinney, Chicago, Ill.

Stem for stamps and analogous drop hammers, consisting of two or more sections adapted to he united in extension of each other, each section adapted for connection with hammer or stamp head and adapted at opposite end for engagement with similar stem section, wherehy said stem sections may be interchangeahly arranged.

FUSE IGNITER.—No. 701,203; C. K. Jenkins and H. J. McDonald, South Butte, Mont.

Fuse igniter, comprising shell having upper ends closed, provided with annular groove on inner surface, containing mass of fusible substance, disk of open-work material fitting within groove retaining fusible substance in place, attaching means connecting shell to ends of hunch of fuses, wherehy same are protected and simultaneously ignited.

SAFETY DEVICE FOR BLASTING PURPOSES.—No. 701,173; J. M. Doyle, Denver, Colo.

Combination with a cap and fuse, wire fastened to cap end of fuse, fastening or knot in wire inside the cap when latter is applied to fuse end, wire carried along fuse endwise and connected therewith, tuhular sheath through which fuse and wire may he passed, permitting removal of reinforced fuse and cap after hole has heen filled and tamped.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

W. Meredith, of San Francisco, is in chargo of construction of the plant of the Vancouver Power Co., to cost $1,000,000 and to provide electric power and light. It is projected to cut a tunnel 2 miles to connect two lakes and give a water supply which will never fail.

The steamer Centennial, en route to Nome, has on board a submarine plow—an ordinary open sluice box mounted on wheels and bottomed with long iron riffles. The box, wheels and riffles are all of iron and weigh about two tons. The machine is operated from the shore by means of endless ropes passing through pulleys set in anchors far out at sea, from 1 to 2 miles distant, and a powerful steam engine on the beach, by which the box or plow is dragged along the bottom of the sea. When in operation it moves at the rate of 7 or 8 miles an hour, thus creating in the box a moving current of water that washes the dirt or sand through the box as fast as plowed or scraped up.

COPPER RIVER DISTRICT.

R. Biel has given an option on his Copper river mines for $500,000, and has offered thirty-five claims on Latouche island, Prince William sound, for $600,000 to same parties. Experts will leave on the next steamer to examine the two groups. The copper river claims number ten and are near the junction of the Copper and Kotsena rivers, 160 miles from the coast. They adjoin the Big Bonanza group, owned by the parties who have taken the option on the Biel ground. The claims contain copper and are on the line of the proposed Valdez-Eagle railway.

SKAGUAY.

The steamer Amur reports navigation through Lake Leharge started and all the Yukon clear.

ARIZONA.

COCHISE COUNTY.

The electric light plant at the big shaft of the Tombstone Con. Mines Co. is in operation.

The Bunker Hill M. Co., of Tombstone, will work their properties.

COCONINO COUNTY.

The Coconino M. Co., at Ryan, has installed a leaching plant and has it in successful operation. The success of this manner of handling the ores of the limesandstone belt is important.

GILA COUNTY.

At the Black Warrior, near Globe, 100 tons of ore are treated daily; the company has fifty tons of copper bullion on hand. Mr. Benson is general manager.

The Verde Smelting, Developing & Ore Purchasing Co. has been incorporated, and is the successor of the Grand Prize Co., which operated in Tonto basin. It has acquired all the interests of the Grand Prize Co. in twenty claims in Tonto basin. The property has development work aggregating 4500 feet; has a 90-ton smelter, hoist, buildings, pumps, etc. The smelter will be in operation July 1.

GRAHAM COUNTY.

At the Lone Star the strike of gold is reported to be principally copper glance.

The Blake & Williams Leaching Co. will enlarge the plant to double its present capacity. The Graham County M. & S. Co. will try to have their ores treated at the leacher. If this fails then a company will be formed to which these mines will be turned over and another leaching plant erected with sufficient capacity to treat all such ore that may he mined in the Lone Star district.

MARICOPA COUNTY.

Another strike of gold is reported in the Oro Grande at Wickenburg on the 200-foot level in the south drift.

PIMA COUNTY.

Tucson is to have a 50-ton smelter by Oct. 1, 1902.

PINAL COUNTY.

The Lobb properties have been sold to Denver parties for $35,000, $1000 cash and eighteen months' bond. These properties are on Queen creek, 3 miles from Silver King. They are a cyaniding proposition.

YAVAPAI COUNTY.

The Iron Mask mine in Eugene gulch, above Big Bug, has been bonded to J. Canovan.

M. R. Parker has sold the Alto group of seven claims on Eugene gulch to the American M. & D. Co. for $50,000 and 300 shares of stock. The purchase money has been paid. Mr Parker will remain in charge as Supt. Work will begin at once.

E. D. Treadwell has returned to Prescott from the Iron Queen, near Mayer. He has finished surveying the pipe line from Wolf creek to the mine. The water supply will be 10 inches and the fall 1500 feet; the length of pipe will be about 9 miles. Work progresses on the smelter site below Mayer.

Work has again begun in the main shaft of the Brookshire, near Jerome. From the 100-foot level they are taking out ore said to run three ounces to the ton in gold. Several tons of this rock are sacked for shipment.

YUMA COUNTY.

L. F. Bradshaw of Quartzsite has sold the Valenzuela to St. Louis and Chicago people, who will erect hoisting machinery and a 100-ton smelter. The ore runs 14% copper, with some gold and silver. He is about to close a deal with St. Louis parties for the Lena D at a good price. The sale lacks only the consent of Mrs. Bradshaw, who owns a half interest. This will very likely be arranged as soon as Mr. Bradshaw returns.

F. Meyers has received the first payment on the Eureka, which is sold for $20,000.

G. U. Ingersoll will sink 500 feet on the Guadalupe.

At Harrisburg men are working on the Harqua Hala mine. Eastern men have taken hold of the property.

In the Mountain Chief group in the Harqua Halas water has been found at a depth of 100 feet in the shaft on the North Star claim. At the 100-foot level 3 feet of copper gold ore shows in the shaft. The ore runs well in gold and carries more than usual copper values in glance and malachite. The shaft will be sunk 200 feet.

CALIFORNIA.

Could all the water be conserved, the snowfall of the past winter in California would guarantee a plentiful water supply through the coming summer. The depth of snow on the western slope of the Sierras has been, if not less, at least no greater than the fall during the winter of 1900 1901. But more than two-thirds of this fell after the close of January. It has generally obtained that the late-falling snow has most rapidly melted, especially when it has fallen on bare ground, with no old snow to rest upon, as was the case this winter. There being no storage capacity in the rocky surface, the snows now covering the ground to a depth of 5 feet or more would, under usual conditions, melt and the water have found its way to the coast probably two weeks earlier in June than last year. Such conditions would point to a shortage in the water supply the coming summer, but they may be offset by the low temperatures which have prevailed during part of April and May, which would delay the melting, prolong the life of the snow and extend the duration of the water supply.

AMADOR COUNTY.

On the Ballard & Martin ground, near Plymouth, Hayward & Lane have men prospecting. It is said they will put in an electric plant on the Cosumnes river, where a fall of 500 feet can he obtained. W. J. Smart, Plymouth, is Supt.

In the Plymouth Rock at Amador City the tunnel is in 520 feet. This will cut the main lead in 190 feet.

The Shenandoah shaft is down 600 feet.

The Bay State ore shoots have been cut at the 700 and 800-foot levels. Milling has begun.

C. H. Shields intends installing a 5-stamp mill on his mine south of Plymouth.——At the Argonaut the shaft is down 2200 feet and sinking continues; it may be put down to the 2400-foot level.——The Hercules quartz mine at Plymouth, recently bought by C. H. Shields and G. Noe of Plymouth, is being developed.

The 10-stamp mill at the George Upton mine, near Plymouth, will soon he in operation. Drifting and opening up the stopes continue.

At the Montezuma mine, at Nashville, many additions have been made to the pay roll. Rock is being mined that averages $7 per ton in the 6-foot vein.

A station pump has been installed at the 1250-foot level in the Oneida which throws 200 gallons a minute.

A streak of rich ore is reported at the Amador-Phœnix mine at the 100-foot level in the drift east.

C. H. Shields will put a 5-stamp mill on his mine near Plymouth.

The Moore mine, near Jackson, will be sold at public auction on the 18th inst.

The Argonaut shaft is 2230 feet deep.

The new mill on the Fremont and Gover ground will soon be started.

BUTTE COUNTY.

Near Nimshew the Bay Counties Power Co. will build a dam, which will be the head of the pipe line to the new power plant to he built on Butte creek. Sixty men are working under the direction of E. W. Slater. The dam will be 40 feet high, a reservoir for water from the Cherokee ditch. Pipe lines will carry the water to Butte creek, a vertical fall of 1600 feet, and a power plant built, capacity 1200 H. P., located above the point where the water now used by the company at the Centerville plant is diverted from Butte creek. Sixty men under U. W. Hupp are enlarging an old ditch that water may he taken from the Cherokee ditch to Centerville. It will take two years to build the dam and install the new plant.

At Garden Ranch, 3 miles southeast of Oroville, eighty acres has been leased to R. S. Grant. An hydraulic elevator will he built. Pipe is being hauled from Cherokee.

CALAVERAS COUNTY.

Work has begun on the Ohio mine at Albany Flat, sinking a two-compartment shaft. M. C. Meeker of Angels is the owner.

At Jenny Lind two companies are prospecting, one operating in the bed of the Calaveras river, the other on the upland. The prospectors in the bed of the channel have a portable steam drilling apparatus. Holes are drilled 40 feet deep to bedrock, the earth removed is run through a rocker to note the quantity of gold therein.

EL DORADO COUNTY.

Work at the Mammoth Bar mine, above Georgetown, will he resumed next month. H. W. Davis is Supt.

The 15-stamp mill at the Boulder mine on Webber creek has been started.

Unwatering the Union mine, near Diamond Spring, has begun and will be finished July 15.

At the Montezuma mine at Nashville a ledge has been struck at the 300-foot level. About 3 inches of the streak runs $64 to the ton. The vein is 4 feet wide of average milling rock.

The tunnel at the Golconda, near Rescue, is being driven and is now in 400 feet. This property is being developed by the Golden Gate M. Co. of Bridgeport, Conn.

The unwatering of the Crown Point, near Diamond Springs, by Lane & Hayward, is completed.

The new map of El Dorado county mines is completed; proofs have been submitted to the State Mining Bureau, for which the map was made.

At the Pyramid mine, near Green Valley, the mill has started; much ore has been taken out, sufficient to insure a steady supply for several months of good milling grade.

The 15-stamp mill at the Boulder mine, on Webber creek, is in operation.

A tract near Green Valley belonging to S. F. Dormody has been bonded to Sacramento parties, who will erect dredging machinery to work the ground.

The new air compressor for the Eureka slate quarry at Kelsey is in place.

Work on the tunnel at the Golconda mine, near Rescue, is going ahead day and night. The tunnel is in 400 feet. The property is being developed by the Golden Gate M. Co.

The James-Beckman M. Co. will build a 5-stamp mill for the Patton mine, near Placerville.

INYO COUNTY.

The Inyo Gold Co. has been incorporated in Los Angeles. The company owns seven claims in Tuher canyon in the Panamint mountains, 8 miles from Ballarat. The principal claim of the group is the O Be Joyful, on which 1400 feet of work has been done.

At the Mineral Ranch group a 5-stamp mill is running. L. H. Mitchell of Los Angeles is general manager.

At the Ratcliff mine, near Ballarat, fifty men are employed at the mine, mill and cyanide plant. Twenty stamps are running and the cyanide plant is in operation.

The Havilah M. Co. of Los Angeles has bought six claims in the Ballarat district. Eight men are employed. A 10-stamp mill will he built.

R. H. Van Camp of Los Angeles represents a company which owns property at Anvil Springs, Ballarat district. Within two months a 10-stamp mill and smelter will be erected.

KERN COUNTY.

The Standard Co.'s pipe line is laid from Bakersfield to the Kern county line. Several hundred men are pushing work toward San Francisco. The pipe is strung out all through Kings county. The line will he finished September 1.

The Producers' M. Co., organized by G. Brown, is opening up the old Sam Blade mine at the western foot of Mt. Breckenridge, near Mojave. The two varieties of ore compel the installing of a stamp mill and a cyanide plant.

A 2-foot vein has been opened in the Minnehaha mine which pans $20 to $25 per ton at 200 feet from the surface.

The Butte Lode Co. during May treated ninety-five tons, which milled $65 to the ton, yielding $6200. For this year up to May 31 the production has been $30,500, against $27.500 the first five months of last year. In the past two years the mine has produced $120,000, to which add 520 tons of tailings at the Red Dog mill at $8 per ton. P. H. McMahon of Johannesburg is Supt.

G. W. Lloyd has a lease on the Nancy Hanks mine, near Stringer. Teams are hauling the ore to the Val Verde mill.

Baney & Van Meter are developing the Pearl Wedge mine in the Stringer district, and are drifting in ore at a depth of 100 feet. On the arrival of the air compressor they will begin sinking.

The Chicago Guarantee Oil Co., leasing on 18, 11-23, from Jewett & Blodgett, is about to drill the deepest well in Kern county. The company is now down 1580 feet with No. 2, and has long since passed through the known oil strata, no oil having been discovered beyond 1100 feet. It is believed that underlying the Sunset district is a stratum of green oil, and it is this that the Chicago Guarantee is after. At 1200 feet a considerable flow of water was encountered, but it is thought this will be shut off without difficulty. At 1580 feet the casing is 7⅝, but it is proposed to put in 6-inch pipe. With the water shut off, the company intends to go 3000 feet, if necessary, to test its theory. In the event of nothing being developed at the greater depth the well will be plugged at 1100 feet, and with the oil sand that has been penetrated at that depth will become a fair producer.

MARIPOSA COUNTY.

(Special Correspondence).—The Mariposa Commercial & M. Co. have completed the electric power plant at Mariposa. The current is brought from the station on the Merced river to the transformer house at the mine under a pressure of 15,000 volts; this is reduced to 440 volts, the strength of the distributed current, which drives one motor at the mine and one at the mill, which has been running since May 27th. An extra compressor has been put in at the mine and run by an electric motor. Lights will be put in both mine and drill. The hoist is run by compressed air.

Mariposa, May 31.

MONO COUNTY.

At the Standard Con. mine at Bodie, for the week ending May 24th, the mill crushed 431 tons of ore. Average assay vanner tailings, $5.63. Concentrates produced 1.38 ton; assay value, $109.04. Amalgam produced, 1461 ounces; assay value, $2.23 per ounce.

NEVADA COUNTY.

The W. Y. O. D., the Gold Hill and the Coe mines are considering the use of oil for fuel.

At the Pine Hill mine, in the Lime Kiln district, work is going on under Supt. Rosenthal, consisting of concrete foundations for new machinery and setting two boilers.

Development work is going on at the Mars Con. at Italian Bar. There are two tunnels, one 300 feet, in which good milling ore has been struck.

The new air compressor and pumps at the Gold Tunnel mine, near Nevada City, are in successful operation.

F. Duhois has bought the Manhattan and other claims on the Baldwin ranch and will buy machinery to work the claims.

In New York, on May 16, sales of 1000 shares of Brunswick Con. (Grass Valley) mining stock were made at 12 cents per share.

At the Allison Ranch mine work is begun on the 20-stamp mill by W. C. D. Body. R. Robinson is Supt.

In the Independence mine at Wolf Creek ore has been found which shows free gold. The 8-stamp mill is running. A new hoist is being put in. C. M. Root of Wolf Creek is Supt.

The Menlo G. M. Co. has sued J. M. Lakenan for $30,000. He was president of the company. The Menlo M. Co. is incorporated with 150,000 shares. Part of this capital stock was given in exchange for the Homeward Bound mine by the president. The Homeward Bound mine was sold for the company for $33,000. This amount was divided among the stockholders, J. M. Lakenan receiving $13,500 as his share. It is now alleged that as this was a part of the capital stock and not profits, the distribution of the $33,000 was illegal.

The Coe mine of Grass Valley, which shut down some months ago, owing considerable money to miners, has liquidated all its indebtedness.

A. J. McCone has a contract for a 50-stamp mill at Allison Ranch mine, near Grass Valley.

Work was resumed at the Golden Gate

mine, June 2 under the direction of Supt. G. R. Tuttle.

The Spanish mine has closed indefinitely.

PLACER COUNTY.

At the Three Stars eighty-five tons is being crushed a day, and much rock is being stored for the smelter.

The Gold Blossom will begin operations soon.

The Baltimore & Hope mine at Forest Hill has been bonded to J. R. Westhall.

The Hancock & Watson mine at Bath has been bonded to G. D. Emery of Boston.

The Haskell & Gaylord claim, near Auburn, is being worked by E. C. Gaylord, who is locally credited with intention to build a mill.

G. Knutsen has bonded the Sacramento gravel mine at Forest Hill and development has begun.

The Black Canyon quartz mine, above Westville, will install a 20-stamp mill. G. Strong is Supt.

SAN BERNARDINO COUNTY.

A strike of gold is reported in the Snowball mining district by John Burke and two companions.

At Camp Rochester, near Bagdad, where the Bagdad mines are, the survey of the railroad is completed. At the mines 150 tons of ore are taken out daily in developing. Twenty-five tons are sent to the mill at Barstow.

Los Angeles parties have secured twenty-one claims in the Black Buttes district, 40 miles northwest of Manvel. Ore from this district is said to run from $100 to $500 in gold per ton.

SAN DIEGO COUNTY.

(Special Correspondence).—The lepidolite mines here are sold to the People's Mutual M. Co. for $50,000. The mineral carries 20% lithia and 40% phosphorus. The purchasers project a chemical works here to make lithia and fertilizer.

Pala, May 29.

SHASTA COUNTY.

The De Lamar smelter has run twelve months without interruption. The average amount of ore treated monthly has been 5000 tons, the monthly product being 500 tons of bessemerized copper. This is shipped via Galveston and the Gulf of Mexico to De Lamar's New Jersey copper refinery. The gold and silver in the copper in the Bully Hill mine and in the ingots are supposed to equal the copper in value.

The Detroit & California M. Co. will dredge the Wynne placer ground on Clear creek, near Horsetown.

Redding reports that the iron deposits on the Pit river, 30 miles northeast of that point, are to be developed this summer by St. Louis, Mo., men.

A 10-stamp mill will be erected on the Fairview mine, near Redding; J. Porter is Supt.

The Great Western G. Co. is erecting a 100-ton smelter near Copley.

The Bully Hill M. Co. owns the Winthrop mine at Copper City, 2 miles from the Bully Hill mine. For several months shafts have been going down at intervals and crosscuts made. The ledge in the Bully Hill mine carries copper; 100 men are at work in the mine.

The Oro Fino mine, on Clear creek, is sold to a company of Santa Rosa men for $12,500—$2500 to be paid cash. The first ore will be shipped to the smelter. If the returns are satisfactory, a large plant will be built.

On Sardine creek, near Gold Hill, G. W. Lane has bonded his claim to Montana men for $10,000.

SIERRA COUNTY.

At the Lecompton mine, near Downieville, the lessees are working in high-grade ore, ten tons of which shipped to the Selby Co. returned $340 per ton. The shaft is 370 feet deep.

R. Phelan of Sierra City has miners working a gravel claim 3 miles from Milton Dam, on the Middle Yuba river. He is reported to have sold the claim to Zellerbach & Sons of San Francisco for $6000.

At Alleghany the Balsam M. &. M. Co. have been developing their property. The tunnel is in 200 feet, an upraise driven 86 feet. The tunnel is in gravel 4 feet deep, which pans well. J. W. Morrell, Alleghany, is Supt.

SISKIYOU COUNTY.

The Journal says that at Oro Fino, Muggins ville, Patterson creek, Quartz valley and other diggings in the Scott valley there is abundance of water for the giants and hydraulic elevators in washing the pay gravel on an extensive scale, and the quartz mills are running day and night.

The Ironside mine, on Cherry creek, is shipping ore.

At the McKinley mine, on Deadwood, work in the tunnel is going on; the ledge is 2 feet wide and shows free gold. The quartz is ribbon rock in character, and the ledge is widening as the tunnel work progresses.——The Deadwood hydraulic mine is running night and day with plenty of water.——Ground sluicing on Spring gulch, a small tributary of Deadwood, has been carried on, and recently there was picked up a $65 nugget.

At Dutch creek, Virginia Bar district, paying quartz is found in the mine of Kelly & Co., who are putting in improvements at mill for crushing.

TRINITY COUNTY.

At the Gold Dollar hydraulic mine, Canon creek, 6 miles above Junction City, from a partial cleanup made after a 200-hour run, with an 11-inch pipe and a 4-inch nozzle under 250-foot pressure, 125 ounces of unquicksilvered gold was obtained. The gold assays $18 47 to the ounce. The gold is mostly coarse, pieces worth $23 being in the lot mentioned.

TUOLUMNE COUNTY.

At the Old Soulsby mine sinking has been resumed in the shaft at a depth of 220 feet. New pumps have been installed, capable of handling all the water.

The Draper mine at Soulsbyville has started up again.

The Sisty Leasing Co. will put in a cyanide plant at the Soulsby mine, Soulsbyville.

It is stated that Ballard & Martin will reopen the New Albany mine at Carters.

J. Oldman, near Crimea House, has an asbestos mine on his ranch The ledge is 1 foot wide and is down 14 feet.

The Mansfield claims, near Jamestown, have been bonded. It is intended to hydraulic some old sinks, which, if profitable, will determine extensive operations.

The Ripperdan quartz mine, near Jamestown, has been bonded to D. J. Lindsay.

At Sebastopol Hill a hydraulic system has been installed and hydraulicking begun.

Hydraulic operations have begun on the Peterson, near Jamestown. This property has produced over $100,000 to date.

All of the stamp mills on the mother lode which are operated by power from the plant of the Tuolumne County Electric Co. have been compelled to shut down owing to a break in the pipe line which supplies the water for the power machinery. This includes the majority of the big gold producers in the county. While the crushing of ore has been stopped, most of the mines are still being worked, as the majority of them have steam power to operate their hoists in case of such accidents, and the miners will continue to take out ore.

Felix Chappelet Jr. has bought the La Preciasa claim.

YUBA COUNTY.

Three Keystone drills are at work on the O'Brien land, near the Yuba river.

COLORADO.

BOULDER COUNTY.

W. E. Alexander of Denver, manager Copper Ranch M. & M. Co., is operating the Kate property and will put in a matte smelter.

C. L. Tripp of the Clara Bell M. & R. Co. of Boulder will put in $30,000 worth of mining machinery for the new mines at Allen's park, 30 miles northwest of Boulder, almost at the foot of Long's peak.

CHAFFEE COUNTY.

At Turret the Vivandiere has a shaft 540 feet deep. At the 500-foot level several hundred feet of drifting has been done, extending in both directions from the shaft, and each drift has opened a body of shipping ore.

CLEAR CREEK COUNTY.

Georgetown reports a strike in the Santiago mine, in the Argentine district, indicating the existence of a continuous ore body 800 feet in length and 3 to 5 feet in width, which will average $100 per ton. The new opening was made in the third level and samples from it assayed ninety ounces silver, three ounces gold and 13% copper. The property is owned by William Rogers.

Lawson mining men want a mill in that district.

At Empire the Waylusing mine has been leased and bonded to Cutting & Co., an association of working miners, who will develop the property on practical lines.

Emerson & Hammack have bought an interest in the Atlantic mill at Empire. The new owners are putting in a turbine wheel.

FREMONT COUNTY.

Low-grade ore has been opened at a depth of 200 feet in the Valley mine, south of Florence.

Florence reports that Secretary Whitney of the Rocky Mountain S. Co. states that E. J. Seeley of Denver and associates has made an offer to lease the smelter for ten years.

GILPIN COUNTY.

During the third week of May the ore shipments and tailings from the Black Hawk depot to the Denver and Golden smelters, and to the concentrators at Idaho Springs, amounted to 97 cars or 1795 tons; total shipments for the first three weeks were 330 cars or 6155 tons.

LA PLATA COUNTY.

Coal miners on a strike at Durango have refused $3 per day of eight hours.

LAKE COUNTY.

J. D. Bartlett, Supt. Twin Lakes G. M. Co., reports on Mount Elbert, at timber line, they have a tunnel 2300 feet cutting a vein that assays silver and gold. The vein lies against a porphyry dike, the streak varies from 1 to 3½ feet. The lower grades are free milling, but the better material is a smelting ore. Along the porphyry dike the tunnel has followed the mineral streak 200 feet. Two upraises have been made 50 feet apart and carried up for 55 feet.

At Leadville the A. M. W. combination employs 200 men and daily ships 350 tons. The Wolftone ships 250 tons daily of crude sulphides; a hundred tons daily of crude material for the mill goes through the Adams shaft.

The output for the month of May for Leadville will foot up 75,000 tons of all classes of ore, an increase over the record for April.

OURAY COUNTY.

The report on the Camp Bird mine, at Ouray, is dated April 26 and was presented in London to the men who bought the property from T. F. Walsh, the owner. The Camp Bird mine is 11,300 feet above sea level, 8 miles from the town of Ouray, the terminus of one of the branches of the Denver & Rio Grande railway system. The 60-stamp mill, cyanide and other plants are 2 miles from the mine, connected by an aerial tramway, by which ore is transported to the mill, and the mining supplies carried from the mill to the mine. The mine has produced to January, 1902, 127,700 tons, having a gross value (recovered) of $4,536,885. The profits during this period were $2,994,778, of which about $650,000 were expended in the erection of the plant and in the purchase of mining ground, etc., the balance having been paid to the owner, T. F. Walsh, as dividends. The ore is gold-bearing quartz, which thus far has yielded an average value of $34 75 per ton of ore treated. About $1 of this value has been derived from the lead and silver contents of the ore. The ore occurs in a complex of fissure veins, having an easterly and westerly general strike, with a steep southerly dip. These veins vary in width from 3 to 15 feet, traced for miles through the country penetrating all the geological formations from the overlying rhyolite, and continuing into the lowest visible geological horizons, i. e., the sedimentaries. The most favorable of the geographical series seems to be the andesitic breccia, which has a thickness of about 3000 feet. It is in this formation that the developments of the mine have been made, and in which the present ore reserves occur. While developments have not been carried on with the view of opening up ore reserves, it is conservative to state that there is practically in sight ore having a gross value of about $5,000,000, and a net value of about $2,400,000. This includes the ore broken and left in the stopes. The result of past workings and the estimated value of the unworked ground shows that each 100 feet vertically of payable ore bearing ground yields $1,000,000 profit. The mine is in active operation, producing at the rate of about $775,000 profit per annum.

SUMMIT COUNTY.

The French Gulch Co. (formerly the Mecca) is working two Evans elevators. Thirty-five men are employed. The elevators are operated night and day.

At the Oro Grande Co., below Dillon, the Evans hydraulic elevators are in operation.

The Mountain Pride mine has started up its concentrating mill.

At Dillon Mgr. Harris has the Oro Grande Placer Co.'s mine in full operation.

Burkley & Crofford, of Denver, are figuring on a concentrator at Montezuma.

The smelter at Robinson is in operation.

TELLER COUNTY.

For drainage of Cripple Creek district one project is to drain the mines by a long tunnel with laterals to all the big mines, the other to sink two or more deep shafts in different sections, to be equipped with powerful pumping plants. The tunnel scheme adherents claim that all that would be asked would be an agreement to pay a certain fixed rate for drainage as soon as the tunnel could be put in operation, or its equivalent in mining concession. The shaft proposition would require immediate assessment of the mining corporations. This expense of sinking would undoubtedly have to be borne by the large operators from the start.

W. S. Stratton, in reply to a request for a lease on a block of his now idle property, says that his superintendents have been instructed to branch out gradually, so that in time his entire estate will be under active development. There are nearly 500 miners on Mr. Stratton's pay rolls at the present time.

The May output for Cripple Creek district amounts to $2,033,600; gross tonnage, 56,200 tons; an increase over April of $101,350, and in gross tonnage of 2300 tons. Following are figures given out by mills and smelters:

Mill—	Tons.	Av. Val.	Total.
Union	13,000	$32	$416,000
Dorcas	2,400	31	74,400
Colorado City	7.000	27	189,000
Standard	14,000	25	350,000
Economic	3,700	36	133,200
Arequa	2.100	10	21,000
Smelters	14,000	60	840,000
Total	56,200	$32	2,033,600

The Metallic Tunnel Co., which is running a tunnel into Copper mountain, is locally credited with intent to erect a $60,000 mill. A vein 41 feet wide has been discovered.

In the annual report of the Last Dollar G. M. Co. Supt. Walden reports that the total amount of development during the year was 4570 feet; 120,884 cubic feet of stoping was done. The company produced 9196 tons during the year, carrying 13,674.10 ounces of gold; the lessees produced 135 tons, carrying 304 ounces. The mine has produced to date $891,479 86

The Mt. Rosa M., M. & Land Co. has transferred survey No. 7407, 15,434 acres, to the Mt. Rosa M. Co. for $77,500.

Development on the Granite mine on Battle mountain is progressing with sixty men. The company ships daily 45 tons ore to Colorado City smelters.

The federal Government will next year make a re-survey of Cripple Creek district.

On the Colorado Boss of the Cripple Creek Con. fifty tons of two-ounce ore is ready for shipment. The ore is obtained at the depth of 100 feet, where an ore shoot 6 to 7 feet in width is found.

In the Accident claim, on Gold hill, good ore was recently cut in the extension of the Pointer vein. An electric hoist will be installed.

The Cripple Creek M. Co., operating the Hull City placer, has completed its new ore house and washer and will have it in operation next month.

In the Trachyte, on Bull hill, a six-drill air compressor is installed. The shaft is being sunk and regular shipments are made from the lease.

IDAHO.

BLAINE COUNTY.

A 600-ton smelter is being erected at Mackay, in Lava Creek district.

J. A. Noggle of Soldier reports active work on the Rosetta M. Co.'s fifteen claims. While development is going on the company will put in a 20-stamp mill.

BOISE COUNTY.

In the Last Chance group at Quartzburg the vein has been encountered on the 250-foot level and the ores present the characteristics of that being profitably milled from the levels above, which averages $25 per ton. It is understood that the mill will be increased and orders for additional machinery will be placed at once J. W. Burton of Salt Lake City, Utah, is secretary.

LATAH COUNTY.

The Black Lead group of copper claims, near Moscow, has been bonded for $100,000, $5000 to be paid July 1, $20,000 January 1, 1903, and $75,000 one year later. This property is in the Bitter Root mountains.

OWYHEE COUNTY.

G. A. Sonneman is at Boise arranging for work on the South Mountain property.

SHOSHONE COUNTY.

The Bunker Hill extralateral case, involving mining property at Wardner estimated to be worth from $250.000 to $1,000,000, has begun before the Federal Court. The suit is brought by the Bunker Hill & Sullivan M. Co. against the Empire State-Idaho Co., to quite title to the ore body having its apex on the Bunker Hill ground. The case is the result of the uncertainty over title to mineral properties located under the present mining laws, which give extralateral rights. The Bunker Hill was one of the first locations in the camp. It is practically a full

claim, 600x1500 feet in size, and it lies upon the main lode of the camp. The present struggle has arisen on account of the manner in which the claim was staked relative to the ore body. Instead of being parallel along its length with the outcrop of the lode, it lies transversely across it. Thus there is about 700 feet of the ledge within the surface of the claim, but the lode passes through the lines which normally would be the side lines of the claim. The lode does not pass out through the normal end lines of the claim. The question, therefore, hinges on the extent of the extralateral rights, if any, to which the Bunker Hill is entitled. Relying upon decisions of the federal courts, the Bunker Hill claims that its side lines really become its end lines under circumstances such as exist in this case. The Bunker Hill, therefore, claims the right to extend its normal side lines in the same manner as if they were end lines and to exercise its extralateral rights by following the ore body westward on its dip out of the Bunker Hill claim past the normal end line.

The Gold Creek Con. M. Co., operating the Bi-Metallic group northeast of Orofino, is working twenty men and will add thereto as fast as room can be made for them. Nine stamps are running. The ore is free milling and runs $8 per ton gold. The ledge on which work is being done is 30 feet wide. There are 2500 feet of tunnel in the mine. All of the tunneling in the mines is steel tracked. Fifteen more stamps will be added to the plant as soon as the new boiler can be installed. The stamps are 850 pounds each.

KENTUCKY.

PULASKI COUNTY.

A. C. Sine, in sinking a shaft near Preachersville for lead, found zinc ore at 20 feet.

MARYLAND.

MONTGOMERY COUNTY.

(Special Correspondence). — At this place, 16 miles from the national capital, is the Potomac gold mine, owned by A. Russ, who is experimenting on various processes for the reduction of his ore, which goes about $10 per ton. There are three shafts, the deepest 125 feet. The ground adjoining the mill has been worked by panning for years. There have been washed from placer ground near by approximately $100,000.

Potomac, May 27.

MICHIGAN.

The Native Copper Times, in its current issue, says that recent estimates that the Lake copper production this year would show an increase of 50,000,000 pounds are excessive. It believes the gain will not be over 30,000,000 pounds, and perhaps not that.

MONTANA.

DALY COUNTY.

The new Amalgamated plant at Anaconda has been successfully operated since the power was turned on. During the first month of its operation it is reported to have effected a saving of nearly $1 per ton on all ore treated over the old plant. The cost of handling Anaconda ore may be reduced 1¼@½ cent per pound to 9 cents.

FERGUS COUNTY.

The Sweeney sapphire mines at Yogo, near Lewistown, have been sold for $50,000.

The plant of the Kendall G. M. Co., South Moccasin district, beyond Lewistown, is completed and running.

The Abbey Cyanide G. M., M. & D. Co., in the North Moccasin, has opened on the Abbey claim a 30-foot lead of cyaniding ore. Samples taken run $2 50 to $6 gold. A 300-foot shaft will be sunk this summer and a small mill erected.

In the Barnes-King ore has been struck. On the 100 level the drift is in 100 feet. Work in other parts of the mine continues and the mill is running steadily.

GRANITE COUNTY.

The Dorothy M. Co. of Phillipsburg will build a quartz mill this summer.

The new Danielsville district is attracting considerable attention. It is 16 miles from Phillipsburg, close to the line between Granite and Powell counties and near the head of Race Track creek. In the Daniels claim, the Golden Leaf, the ledge is 12 feet wide; the ore is free milling and assays have shown values of $30 to $100 per ton. There are 300 tons of ore on the dump to be shipped as soon as snow disappears. A 20-stamp mill will be erected this summer. Tests made show that 80% of the gold can be saved by amalgamation. T. D Daniels, Danielsville, via Phillipsburg, is in charge.

R. S. Levirdge has secured a lease on the Nonpareil property, near Princeton, and will begin work immediately. The Nonpareil is a silver-lead mine. The ore will be concentrated by hand jigs. The product will be shipped to the smelters.

JEFFERSON COUNTY.

A strike was made in the Gray Eagle mine, 5 miles from Basin, disclosing a body of free-milling ore showing wire gold and native silver.

MADISON COUNTY.

At Norris twenty men are at work in the Revenue mine. Manager Knox reports a strike of rich ore in the lower workings.

The Old Red Bluff mine is being developed under the supervision of Mr. Austin.

The Norris M. Co. has been organized. A. Bartes, local manager, has bought the Comstock group of five claims. The vein is from 4 to 9 feet wide; the ore is a cyaniding proposition.

The old Montana Boy property is bought by Minnesota men. The new company will add a concentrator and cyanide tank to its plant.

B. T. Hickman of Rochester and C. W. Cooper of Butte have a lease and bond on the Ahlie Alice mine, 1 mile from Rochester. The bond is $30,000 and runs one year. The shaft is 238 feet deep and levels have been run at 100 and 150 feet. The pay shoot is 20 inches to 3 feet wide. The ore is gold bearing; there are on the dump 250 sacks of ore worth $50 per ton; shipments are made to the Colorado smelter, Butte.

The Basin & Bay State M. Co. will sell its smelter at Basin.

SILVER BOW COUNTY.

The West Stewart mine, owned by W. A. Clark, is to be equipped with steel gallows frame and power plant.

The Butte Copper M. Co. has leased and bonded the Amazon claim on the foothills of the Eastern mountain range for $75,000 to May 1, 1903. The company will extend the old shaft, now down 180 feet, to a depth of 380 feet.

NEVADA.

CHURCHILL COUNTY.

The Bell Mare and other copper mines in Cottonwood district are to be consolidated and incorporated with $5,000,000 capital.

ELKO COUNTY.

Statistics show that the total bullion product of Tuscarora to date is $34,893,306. Of this total $29,415,750 was silver and $5,477,556 gold—a total coinage value of $34,893,306.

The machinery of the Grand Prize & Union mill in Tuscarora is being demolished and shipped to Sacramento as scrap iron.

ESMERALDA COUNTY.

(Special Correspondence) — The Haggerty-Jordan Copper M. Co. of Caribou, Wyo., has a working bond on twenty-five copper claims in Gillis mountains, 35 miles southeast of here, for $75,000, and $500 a month to be expended for six months, a cash bonus to be paid July 1.

Hawthorne, June 1.

Messrs. Fagin & Gilloon report a discovery of cinnabar east of Luning.

The Sweetwater Con. M. & M. Co. at Sweetwater has twenty men at work.

EUREKA COUNTY.

The Eureka & Palisade Railroad is reported to be negotiating with the Southern Pacific as to a reduced rate on low-grade ores shipped from the Eureka district.

LINCOLN COUNTY.

(Special Correspondence.)—The Mendha group, near Pioche, has been bonded to E. C. Higgioson for $80,000. This property was operated by the Pioche Con. M. Co. years ago and yielded many dividends, until the decline in silver closed it down. There is on the old dump 3000 tons of ore that will, it is said, average $48 gold, 18% lead and 15 ounces silver to the ton. This can be profitably treated at the Bristol smelter.

The Bingham and Welland group, 4 miles from Pioche, have been sold to F. O. Richardson of British Columbia for $20,000. Development is going on. The ore carries gold, silver and lead.

Pioche, May 25.

Smith & Ryan have sold the Pennsylvania to J. Adams of Bingham, Utah. The claim is near Meadow valley, Pennsylvania district. Samples taken assay $21 gold, 60 ounces silver, 15% copper. A 10-stamp mill will be built.

LYON COUNTY.

The only Silver City mines producing ore are the Oest and Silver City. Active prospecting work is in progress on other locations. Three companies are prospecting in the Silver City mines, two having leases and the other working on a privilege. Fifty-five tons of ore from the mine returned over $1000 in gold bullion, the lessees netting about miners' wages.

NYE COUNTY.

(Special Correspondence.)—A strong effort is being made to reach the Salt Lake furnaces with the Tonopah ores. Salt Lake ore buyers have sampled several lots and have offered working charges lower than those offered by some coast smelters. As the railroads can be guaranteed a tonnage to Salt Lake valley probably in excess of the capacity of Pacific Coast smelters to treat, the higher rates due to the longer haul may be sufficiently reduced by the railroad to make feasible the shipments of Tonopah ores to Salt Lake valley smelters. Trial shipments will be made shortly.

Tonopah, June 1.

Analysis of Tonopah ores shows: Insoluble residue (silica). 86.08%; ferric chloride and alumina, 4 85%; manganic oxide, 2 95%; silver and gold, 1.06%; lime, trace; magnesia, trace; lead, trace; sulphur, 0; loss by ignition, 2.70%; total, 99.64%.

J. A Yerington of Carson is reported organizing a company with $1,000,000 capital to pipe water 60 miles into Tonopah.

The G. & H. tunnel is sold to Arthur Brock, president Tonopah M. Co., for $250,000—$30,000 down, $100,000 in eight months, $120,000 in ten months.

STOREY COUNTY.

The latest reported sales of Comstock Tunnel Co.'s (Sutro tunnel) stock in the New York market were 1500 shares at 5½ and 6 cents per share, May 20 and 21.

The output of ore from the Con. Cal. & Va. for the current week amounted to 92 cars, assaying $50.34 per ton, and 138 cars assaying $19 38 per ton.

WHITE PINE COUNTY.

Local reports are to the effect that from the grass roots at Cherry Creek prospectors are extracting gold ore of the value of $70 to $200 per ton. The Glasgow & Western Co.'s Star mill is aiding in development.

E. L. Giroux of Denver, Colo., and associates were in Pioche en route to Ely to inspect the Pilot Knob copper claims which they have been developing. Their option expired June 1st. The present visit to Ely is regarding the purchase of the property. The Pilot Knob copper mines consist of fifty claims 10 miles from Ely.

Water has been encountered in the Aultman shaft at Ely and the work of sinking has been abandoned for the present. A station is being cut above the water level, and when this is completed drifting to the south will be commenced. At a depth of 285 feet ore was cut, carrying gold values of $4.40 and a trace of copper; on this the drift will be extended.

NEW MEXICO.

SANTA FE COUNTY.

A $45,000 plant for the Baird M. Co. at Golden will be put in. This property consists of a bed of cement, some places 30 feet deep, carrying free gold.

OREGON.

BAKER COUNTY.

Manager J. M. McPhee, Golden Wizard mine, Minersville district, states that his company is considering the installation of a large treating plant. The shaft is down 130 feet; 60 feet of this is in ore that assays $18 a ton.

JOSEPHINE COUNTY.

San Francisco capitalists will utilize the power of Applegate falls, on Applegate river, western Josephine county. Electric power will be generated to operate stamp mills, mining machinery and factories in Josephine county, as well as a portion of Jackson. Power will also be generated for a line from Grants Pass to Waldo, the copper district of southwestern Josephine county.

The ledges on Grave creek, in the Mt. Reuben district, are being worked extensively.

W. H. Brevoort of New York and E. Smith of Los Angeles, stockholders of the Victor Junior mine, in the Grave Creek district, announce that they will add twenty stamps, a number of new concentrators, a cyanide plant and a quantity of other machinery to their mine.

The property of the Big Yank M. & M. Co., in the Galice mining district, has been bonded to L. Y. Keady of Portland.

At the Greenhack mine, Grave creek, the work proposed consists of a shaft to be sunk 500 feet below the 800-foot level and the erection of a 20-stamp mill, to handle fifty tons a day. The stamps are to be 1000 pounds; an 80 H. P. power compressor will be put in to run six machine drills. The mine will be equipped with electric lights. A cyanide mill will be erected.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The contract for building the new reduction works of the Hidden Fortune G. M. Co. will be awarded at the Denver, Colo., office next week. The mill will be 1 mile below Deadwood, on Whitewood creek, and will have 100 stamps to start with. It will be built with a view to turning it into a combination amalgamation and cyanide plant; for the first few months it will be run as a wet crushing cyanide, the ore to be crushed with stamps in a solution of cyanide, because the company has a large amount of siliceous ore on which amalgamation would be an entire loss. The amalgamation feature will be added after the company is ready to begin treating its free-milling ores.

The capital stock of the Homestake M. Co. has been increased $840,000, making $22,840,000 listed to date.

UTAH.

Utah mines produced $1,905,960 in May.

BEAVER COUNTY.

At the Old Hickory mine, near Beaver, a working shaft will be sunk. The vein will be developed on the surface by open cuts. The old workings have developed the vein 90 feet deep, showing 10 feet of ore which assays 12% to 16% copper and good values in gold and silver.

The vertical shaft at the Sheep Rock is down 90 feet and will be sunk to the 300-foot level.

BINGHAM COUNTY.

The Montana Coal & Coke Co., controlled by the Bingham Con. M. & S. Co., has a daily output of 700 tons of coal and 200 tons coke.

IRON COUNTY.

Hematite and specular iron have been discovered at Red creek.

B. C. McDonald, assistant manager the Johnny at Stateline, says the new strike in the Willowvale group is proving satisfactory and that ore is being sacked that will average .0260 gold per ton, or $10 a day to the man. The new mill plans are in the hands of Dederichs and Burke.

JUAB COUNTY.

The Sunbeam M. Co., Silver City, will put in a station pump, 500 to 700 gallons per minute capacity. T. Walden, Supt.

At the Bullion-Beck at Eureka sixty persons are on the payroll. Manager Farnsworth, it is said, has obtained from the American S. & R. Co. a working charge that will enable him to move the siliceous ores.

If negotiations are successful, the Annandale will be able to open territory through the 500 foot level of the Emerald shaft. This level will tap the Annandale vein at a vertical depth of 800 feet.

At the Emerald, at Tintic, a winze is going down on $10 ore below the 700-foot level. The vein, a strong one, is showing much quartz—2% copper in a red oxide and gold and silver.

Ore shipments from the Tintic district for the week ending May 31 amounted to sixty-eight carloads, as follows: Bullion-Beck, 8; Gemini, 10; Godiva, 2; Yankee Con, 6; Ajax, 1; Carisa, 5; Dragon (iron mine), 15; Grand Central, 3; Mammoth, 1; Lower Mammoth, 4; Sioux Utah, 3; South Swansea, 10.

SUMMIT COUNTY.

The final payment on the West Ontario group at Park City has been made and the property, consisting of twenty-two locations, is in the custody of a Tennessee company; $120,000 has been paid for the property.

Following are shipments of ore from Park City for week ending May 31:

Daly West	3,576,000
Ontario	1,516,000
Anchor Con	433,000
Total number of pounds	5,525,000
Silver King	1,877,189
Grand total	7,402,189

SALT LAKE COUNTY.

In the Highland Boy Con., at Bingham, an 18-inch streak of ore has been cut in the Leonard tunnel. Assays show 2% copper, 35% lead, ten ounces silver and $1.20 gold per ton, and an excess of iron.

Grading for the towers of the United States bucket tramway is completed.

Work on the Congor mine, near Bingham, has been resumed. The Congor has copper-bearing milling ore in sight.

From the Highland Boy Con. three carloads of ore sold to the Bingham Con. smelter showed assays of 25% copper, 10 ounces silver and $3.50 gold per ton, with an excess of 30% iron, which latter earns $4.50 per ton.

At the Bingham Con. during the month of May there was put through the furnaces 7528 tons of ore, the greater percentage of which came from the company's holdings at Bingham. The electric tramway has been started. The smelter has

since the converters went into commission on May 6 produced 222 tons of copper bullion carrying gold and silver, valuation $550 per ton.

TOOELE COUNTY.

(Special Correspondence.)—The stated intention of the W. A. Clark management in Ophir canyon, near Ophir, is received with great interest, and its bearing on larger undertakings that are likely to follow the installation of the electric plant is fully recognized. The establishing of such plant would not only furnish power to the Clark mines and concentrator and the tramway between the two and light to Stockton, but there would naturally follow the constructing of furnaces to produce high-grade matte from the product of the concentrator, and the consequent doubling the capacity of the same.

Ophir, June 1.

(Special Correspondence).—Cinnabar in commercial quantity has been discovered on the property of the Sacramento M. Co. here. A furnace for reducing the ore will be included in the plant now building for the company. Cinnabar has been previously found in small quantities in the Marion and Mercur mines. In the Sacramento the ore has been opened up 15 feet along the strike of the vein; assays show 25% quicksilver and $8 gold per ton. The discovery was made in crosscut off main tunnel, along a porphyry dike. This dike has pitched the main ore bodies from the normal dip of 15° to an angle of 65°. The extent of this ore body is undetermined at depth of 150 feet below the surface, but it appears above and below the drift and indicates a permanent channel following the dike which serves as the hanging wall, limestone foot wall; between the two there is 25 feet of gold-bearing ore and this cinnabar. The gold ore has been continuous for 250 feet depth. By June 15 milling will be under way again. The agitation method will be used in the cyanide process.

Mercur, June 1.

At Mercur during the month af May the output from the Con. Mercur exceeded 30,000 tons of gold-bearing ore. In addition to this crude ore, which was leached in a set of thirty-six tanks of a capacity of 250 tons each, there was treated at the Manning mill 500 tons of tailings daily in eighteen tanks of 136 tons each. The product at the two plants is known to have reached $160,000.

WASHINGTON.

FERRY COUNTY.

At the Trade Dollar, in Nespelim district, cutting out station for the 300-foot level has begun.

At Republic the Silver Dollar shaft is timbered 60 feet; sinking will be continued. After machinery is installed the shaft will be sunk to 200-foot level. W. H. Crummer will install machinery. Two 24 H. P. hoists are decided on.

The station at 300 level in Trade Dollar, at Republic, is made; crosscutting has begun.

A steam hoist will be put in by the Silver Dollar, which will handle ore and water from 600 level.

In the Mountain Boy adit tunnel a 5-foot vein has been opened and followed 40 feet. Averages across 4 feet gave $40.50 in gold, silver and copper.

STEVENS COUNTY.

O. Szontagh, manager LeRoi smelter, Northport, says that, so far as he is aware, the smelter will continue its operations without any close down except such as may be necessary for repairs.

FOREIGN.

AUSTRALIA.

The gold yield of the State of Victoria for the last four months amounted to 211,413 ounces, the yield for April being 48,946 ounces.

Scarcity of water interferes with operations in the Mount Morgan mine. Owing to the diminishing richness of the ore, greater attention is being paid to the metallurgical expenses. Considerable improvements are being made in the chlorination works. The manager and metallurgist have returned from an extensive visit to leading gold reduction works throughout the world.

BRITISH COLUMBIA.

T. W. Gibson, director Bureau of Mines, furnishes a table showing the output of the Ontario mines for the first three months of this year. The figures are supplied by the mining operators and companies. The aggregate value of the production for the first quarter of 1902 was $1,254,685 as against $824,076 for the first quarter of 1901, an increase of $430,609. The value of the gold taken out this year as against last was $77,068 to $54,820. Gains—Gold, $22,548; silver, $4954; nickel, $355,498; copper, $121,545; arsenic, $2238.

Finch & Campbell, who control the Second Relief, near Ymir, will put in a cyanide mill at the property with a capacity of fifty tons a day.

The Queen mine, 14 miles from Salmo, operated by the Holmes syndicate, has paid for its development, stamp mill and all mining machinery. The Yellowstone mill was secured. A shipment of three cars of ore to the Hall Mines smelter returned $3441.02. The mill is handling twenty-five tons of gold ore a day.

At Ymir the Broken Hill M. & D. Co., operating the Wilcox mine, has decided to erect a stamp mill.

At Rossland the Rambler-Cariboo mine has resumed operations with over 100 men. A boiler plant will replace the water power. The ore concentrates 6 to 1. The company is figuring on shipping concentrates carrying 200 ounces silver and about 55% lead.

CHINA.

In the mines of the Provinces of Shansi, Shantung, Feng-tien, Hunan, Szecbuen, Yunnan and Kyao-chau the employed, and generally the miners, are paid on shares. The usual rate is about one-third of the product to the miners and the remaining two-thirds to the owners of the mines. An entirely different system of paying the miners was adopted by the Mo-ho G. M. Co., whose extensive mining rights were situated between Mongolia and Asiatic Russia, embracing hundreds of square miles of rich alluvial and placer deposits. For the successful exploiting of this vast mineral wealth, it was necessary to overcome the tremendous obstacles arising from distance, severity of climate and total lack of labor. To settle the latter question, it was resolved by the company to inaugurate a regime which would induce the laboring classes of Shantung and Chihli to try their fortunes in the Mo-ho El Dorado. The company offered a complete outfit to every able-bodied man, besides advancing a substantial sum for traveling and other expenses incidental to the journey from Tientsin or Chefoo to Mo-ho. Upon arrival, each miner was assigned a large area for his exclusive exploitation. Stations were established at different points throughout the whole region, guarded and protected by the military police furnished by the Chinese government. Ostensibly, the miner enjoyed the entire product of his labor, and the company exercised no control over his mining operations, provided he kept within his allotted area. It was stipulated, however, that the miner should sell all his dust to the company, at a price fixed by the latter, and obtain all supplies from the company's stores. By this arrangement the company was able to recoup the original outlay, which was very heavy, and the miner was given an incentive to work. Many of the miners after the first two years became independently rich, while on various occasions the company declared an annual dividend of 150%. Up to the Boxer uprising of 1900 the Mo-ho G. M. Co. was the most profitable mining enterprise in China. Since the Russians have acquired control of this territory, all mining operations have ceased.

Minister Conger transmits to the State Department the details of new regulations for mining in China. They are so onerous as practically to preclude the development of the empire's mineral resources by outside capital. A tax is levied on mineral products as follows: Coal, iron, borax, alum, etc., 5%; kerosene, copper, lead, tin, suiphur, 10%; gold, silver, spelter, quicksilver, 15%; diamonds, crystals, 25%. This is in addition to the export duty to be fixed by the customs authorities. One per cent of the capital stock is to be paid upon issuance of the permit to mine. Each company must begin work within one year and must establish a mining school. Accounts shall be made up each year, and of the net gain 25% must be paid as royalty to the Chinese Government.

LOWER CALIFORNIA.

The People's Mutual M. Co. of New York City have bought the Valladares gold mine and propose putting up a 100-stamp mill.

MEXICO.

The Nopal mine, near Parral, has been sold by D. M. Evans to W. V. Pettit.

SONORA.

Nine miles from Alta the Veta Grande M. Co. has completed a quartz mill, capacity 100 tons daily.

The United States M. & S. Co., organized in New York, has bought the Ahogado mine, 20 miles from Hermosillo. T. B. Johnson, El Paso, is general manager.

ZACATECAS.

The Bote mine at Zacatecas has been paying dividends fifty years. Four-fifths of the stock is owned by R. Kerrigan of England. The pay roll is $30,000 per month; the mine pays a net dividend of $50,000 per month. The San Rafael mine has paid large dividends and is now paying expenses. The pay roll is $40,000 per month. The Veta Grande is paying expenses and doing development work on a pay roll of $20,000 per month.

SOUTH AFRICA.

At the Rand mines the number of stamps running is estimated at 2000, out of a total of 6000.

The peace proclamation that the Boer war is at last ended starts renewed interest in the Rand.

The number of stamps crushing in March was 1540, 1260 in February. The output was: From the mill, 65,927 ounces; concentrates, 2093 ounces; tailings, 33,513 ounces; slimes, 2594 ounces.

The following shows the results from each individual mine:

Name.	Tons crushed.	Output. Ounces.
Angelo	6,755	4,154
Bonanza	7,912	7,072
City and Suburban	8 650	4,410
Crown Deep	9,487	4,094
Crown Reef	11,378	6,175
Driefontein	7,243	3,802
Durban Rood	6,125	3,982
Ferreira Deep	5.270	2,674
Geldenhuis Deep	16,880	7,829
Geldenhuis Estate	8,715	4,128
Ginsberg	5,409	3,138
Glen Deep	3.940	670
Henry Nourse	6,835	3,169
Jubilee	3,990	1,234
Jumpers Deep	10,488	2,341
Lancaster W	5,077	900
Langlaate D	10,286	3,980
May Cons	8,441	4,204
Meyer and Charlton	5,674	2,675
New Heriot	1,467	380
Nourse Deep	4,564	1,511
Rietfontein A	4,835	2,417
Robinson D	5,270	2,380
Rose Deep	11,200	4 795
Robinson	8.305	8.015
Salisbury	3.541	1,046
Treasury	8,310	4,181
Village M. R.	9,480	4,440
Wemmer	6,600	4,316

From Jan. 1 to April 1 value of the output of the Rand trebled.

The total gold output of companies making returns to the Rhodesian Chamber of Mines at Buiawayo for March was 17,559 ounces. The montbly returns since 1899 have been as follows: 1902, 63,609 ounces; 1901, 172,060 ounces; 1900, 91,816 ounces; 1899, 65,303 ounces.

At Johannesburg, more than 2000 stamps are in operation, and it is believed that more than half the gold mines and mills will be working by July.

SOUTH AMERICA.

Silver ore is being shipped from Chile to Pueblo, Colo., consigned to the American Smelting & Refining Co., which has been receiving cars of this silver ore from Chile since March 17th. This ore is shipped by steamer to Galveston, Texas, and there is transferred to Colorado & Southern cars and sent to Pueblo by that route. The total amount of the ore consigned to Pueblo smelters this year from Chile is about 400 carloads.

Commercial Paragraphs.

THE Colorado Zinc Co, Denver, Colo., are putting in another separator and will double their zinc output. They are also adding two more Wilfley tables and one Dimmick classifier.

THE California Electrical Works, San Francisco, Cal., are placing on the market their new type Sunbeam incandescent lamp, which they carry in all candle powers, voltages and efficiencies.

THE Crocker-Wheeler Co. is making extensive preparations to accommodate the increasing business which during the past year has pushed the present shops to their utmost. A new building is under construction which will enlarge the present floor space by 60,000 square feet and be occupied by the winding department, a part of the office force, and additional machine shop space.

MGR. GEO. H. ISMON, of the American Steel & Wire Co.'s Pacific Works in San Francisco, Cal., has chosen a site for the new establishment, Sixteenth and Folsom streets, where a new plant will be erected, with a frontage of 180 feet on Sixteenth, 520 on Folsom and 460 on Fifteenth, covering 129,000 square feet. On the Fifteenth street side will be the Pacific Wire Rope Works and the Cal. Wire Cloth Co. Woven wire fencing will also be manufactured.

THE Colorado Iron Works Co., Denver, Colo., have orders for two sets 40x16-inch crushing rolls, and two Bartlett concentrators for the Montezuma Lead Co., Mexico; one 42x120-inch blast furnace for the New Jersey Gold Copper Reduction Co., Leadville, Colo.; four impact screens for Velordena M. & S. Co., Mexico; ten 90 cubic feet capacity side roll dump cars for Compania Metalurgica Mexicana, San Luis Potosi; eight lead cars for Ohio & Colorado S. & R. Co., Salida, Colo.

THE Salt Lake, Utah, office of the Allis-Chalmers Co. reports the following sales in May: Two converters for the United States M. Co.; power plant for the Troy Laundry, Salt Lake City, consisting of 12x36-inch Reynolds engine, Reynolds heater, shafting, pulleys, etc.; 500-ton sampling works for the Park City Sampling Co., of Park City, Utah; four matte ladles for the Bingham Con. M. & S. Co.; one 150 H. P. return tubular boiler, for the Honorine M. Co., at Stockton, Utah; elevator material for the Utah Fuel Co.; two converters for the Bingham Con. M. & S. Co., Salt Lake City; one No. 6 Gates style "D" crusher, for the Lime King M. Co.

THE Boston & Montana Con. C. & S. M. Co. is making additions to the electrical equipment of its smelters and refineries at Great Falls, Mont., having recently bought eleven 15 H. P. and three 40 H. P. Westinghouse, 500-volt, shunt wound, direct current motors. Four years ago this company installed a number of Westinghouse 180-volt electrolytic generators and at the same time put in a large number of Westinghouse and other motors for driving ventilating fans and other machinery about the smelters. Although the smelters are filled with sulphur dust and are dirty, the Westinghouse motors have given satisfaction. The Boston & Montana Co. states that the commutators of the Westinghouse motors are the only ones which are sufficiently insulated between bars to prevent bad grounds.

THE Hidden Fortune G. M. Co., operating low grade gold-bearing ore near Lead City, S. D., has closed a contract with the Colorado Iron Works Co for reduction, cyaniding, refining, power and lighting equipment that will cost $200,000. There will be six 10-stamp mills, 1050-pound stamps, ninety drops per minute. The cyanide plant includes two steel solution tanks, 20 feet in diameter, 6 feet deep; five leaching tanks, 40 feet diameter, 6 feet deep; three steel slime tanks, 12 feet diameter, 16 feet deep; two steel gold tanks, 12 feet diameter, 8 feet deep; three steel sump tanks, 30 feet diameter, 8 feet deep. The refining plant includes a full equipment. The crusher for the plant is 15x30; the ore grizzly, 4x8; principal engine, cross-compound, non-condensing, Corliss, high pressure 18x48, low pressure cylinder 34x18. The engine to drive the dynamo for electric light purposes is a 12x16 70 H. P., with sufficient power to drive a 120-stamp mill plant. The electric light plant generator will supply 50 arc lamps and 220 16-candle power incandescent lamps. There are two boilers, 175 H. P. each, a low-pressure Leyner air compressor, capacity 700 cubic feet of free air per minute at thirty pounds, steam driven. This equipment will handle 250 tons ore every twenty-four hours.

Books Received.

On the "Study and Difficulties of Mathematics," by Augustus De Morgan, Chicago; Open Court Publishing Co., London, Kegan, Paul, Trench Trubner & Co., Ltd.; pp, 288. Price, $1.25.

"Handbook for Street Railway Engineers," by H. B. Andrews, C. E.; 3x5 inches; 202 pp., 41 figures. Published by John Wiley & Sons, New York. Price $1.25. A handy pocketbook of tables and useful data for street-railway engineers, containing mensuration, trigonometrical formulæ, curves, strength of materials; also, much electrical information in its application to street railways; bound in convenient form; clear typography and good paper.

Catalogues Received.

The Jeanesville Pump Co, Jeanesville, Pa., send an "advance sheet" that portrays pumps and incidentally furnishes considerable advance information. It is of interest in this regard to note that for every ton of anthracite coal mined there is pumped from nine to twelve tons of water. (It is also interesting to know that there are $10,000,000 invested in mine pumps in this west half of America.) The trade treatise is got up in the usual good style of this company, and is worthy the attention of men interested in this subject. A request sent to A. Middlebrook, 1328 Seventeenth street, Denver, Colo, to the Joshua Hendy Machine Works, 38-44 Fremont street, San Francisco, Cal., or the company's home office, will bring a copy of this booklet by return mail.

Catalogue No. 51 of the Christensen Engineering Co., Milwaukee, Wis., describes their electrically operated, stationary and portable air compressors, which are not steam-driven compressors

with a motor attached, but self-contained units. The detail parts are made from jigs and templets and are interchangeable. The working parts operate in a bath of oil.

"Catalogue B, 1902, Leyner Air Compressors, and herein incidental mention of other machinery, articles and things done at our works," is the taking title of a sumptuous brochure from J. George Leyner, Denver, Colo., which is deserving of notice because of its style and contents. There is a little introductory treatise on air compression which tells in plain United States, air compressors are good things. There is a further discussion of mechanically actuated air valves, which is a little more technical, and which gives more real information than some pretentious text books on that subject. Then as a good business proposition a description of the Leyner straight-line simple steam actuated air compressor, which brings out several good points clearly. This is followed by several pages of description of various other styles of compressors made by the Leyner people. On page 58 is a picture that is a trade winner for a mining country where transportation hasn't yet got to the palace car stage. Then comes some remarkably fine tables of compressor efficiencies and capacities at various altitudes, after which the water Leyner rock drill receives deserved attention. Altogether there are 69 subjects described and there isn't a dull page in the entire 82 to any man that is interested in these things. Five-dollar books are sold with less valuable information on these subjects than that in this handsome publication which is as far ahead of the old style catalogue as a decapod engine is ahead of a handcar. The book is superbly produced and will be sent anywhere on request. Address J. George Leyner, 1033 Seventeenth street, Denver, Colo.

Personal.

H. A. COHEN is visiting De Lamar, Cal.

J. MCCHRYSTAL is Supt. Gemini mine, Tintic, Utah.

O. B. PEASLEY is Supt. Havilah mine, Nashville, Cal.

C. T. DUDLEY is Supt. Sellier mine at Forest Hill, Cal.

J. T. KENNEY is Supt. Mineral Ranch mine, Ballarat, Cal.

C. H. BLAKE is Supt. Fannie Marie mine, Glencoe, Cal.

J. A. BRENT is superintendent Red Cross mine, Omega, Cal.

A. MAYBERRY is superintendent U. S. smelter, Bingham, Utah.

T. WALDEN is superintendent Sunbeam M. Co., Silver City, Utah.

E. D. MOOERS, of Randsburg, Cal., will spend two years in Japan.

D. A. MCDONALD of San Francisco has gone to Golovin bay, Alaska.

E. W. CAMP is manager Victory mine, Glendale, Douglas county, Or.

A. L. HEASTON is superintendent Telluride M. Co, Bingham, Utah.

A. CARTER is Supt. Blue Eagle mine, Jawbone, Mariposa county, Cal.

A. MAYBERRY is Supt. U. S. Co.'s Bingham properties, Bingham, Utah.

C. E. SEYMOUR is superintendent Vandalia mine, Shingle Springs, Cal.

JAS. CALLBREATH is in charge of the Puzzle mine, Breckenridge, Colo.

J. W. MORRELL is superintendent Balsam M. & M. Co., Alleghany, Cal.

FRED ZEITLER has returned to San Francisco from Nevada City, Cal.

S. H. BROCKUNIER, E. M., of Butte, Mont., is in Salt Lake City, Utah.

WM. LEWIS of Stent, Cal., is now foreman of the Republican mine there.

V. M. CLEMENT has returned from New York to Salt Lake City, Utah.

P. J. NEVINS is now manager French Gulch G. M. Co., Breckenridge, Colo.

FRANK R. WEHE has moved from Sierra Co., Cal., to San Andreas, Cal.

THOS. SHELTON of Leadville, Colo., has returned there from Denver, Colo.

C. K. MCCORNICK has returned from Kingman, Ariz., to Salt Lake City, Utah.

B. F. HOOK has returned to San Francisco from an extended trip through Mexico.

G. J. C. DONALDSON, C. E., engineer Merced G. M. Co., has located at Carters, Cal.

L. W. MORGAN is smelter superintendent for the Troy Copper Co, Troy, Arizona.

JOHN MCCOLL of Leadville, Colo., is the new Supt. Lucania Co., Idaho Springs, Colo.

H. K. MASTERS has been appointed superintendent U. S. smelter, Bingham, Utah.

R. F. JONES of Leadville, Colo., is now foreman Dakota mill, Deadwood, South Dakota.

W. J. BELCHER is superintendent White Bear M. Co, Monte Cristo, Nevada Co., Cal.

DANIEL DE CORTAZAR has been appointed director of the Geological Survey of Spain.

A. B. HARMON is now general manager Gilpin - Cripple Creek M. Co., Altman, Colorado.

S. A. HARSH of Denver, Colo., has spent several weeks among the mines in Wyoming.

W. H. FERGUSON is Supt. Hurricane mines, near Thumb Butte, Yavapai county, Ariz.

JAS. HANLEY is now superintendent Cerro Colorado mine, Altar district, Sonora, Mexico.

SUPT. JNO. BOYLE of the Lenore M. Co. has returned from St. Louis, Mo., to Kingman, Ariz.

H. Z. OSBORNE has returned from the Dorleska mine, Trinity county, Cal., to Los Angeles, Cal.

A. F. ROSENBERGER of the Nelson, B. C., Mine Exchange, is establishing a branch in Chicago.

A. H. BROWN, general manager Trinity Copper Co., Kennet, Cal., has returned there from Boston.

R. V. ELLIS of San Francisco is erecting three new rigs for the A. & P. Oil Co., Spring Valley, Wyo.

F. MONAGHAN of Needles, Cal., succeeds W. S. Keyes as trustee California State Mining Bureau.

L. L. MYERS, Supt. Malakoff mine, Nevada county, Cal., is examining mines in Plumas county, Cal.

ARTHUR HENDY, superintendent Copper Chief M. Co., has returned from Mexico to Jerome, Arizona.

F. R. BYRNES, manager Penobscot M. Co, Deadwood, S. D., has established an assay office in that city.

L. W. TATUM of Chicago has returned from Negaunee, Mich., where he had been examining iron deposits.

ROBT. ROBINSON, Supt. Allison Ranch mine, has returned to Nevada county, Cal., from San Francisco.

CHAS. D. LANE and party left Seattle, Wash., on the 5th inst. on the steamer Oregon for Nome, Alaska.

BERT DELERAY has resigned as Supt. Republican mine, Tuolumne county, Cal., and goes to Nome, Alaska.

F. B. KING, representing Douglas, Lacey & Co., is visiting the California properties of the company.

J. W. NEILL, who has been examining the De Lamar mine, De Lamar, Nev., has returned to Salt Lake City, Utah.

C. H. HAND, E. M., of Montana, has been at Pioche, Nev., inspecting mining properties in which he is interested.

F. R. BLOUNT, president Oro Grande Placer M. Co., is in Breckenridge, Colo., inspecting the company's property.

C. E. ALLEN, manager Centennial-Eureka, Tintic, Utah, has returned to Salt Lake City from Bingham, Utah.

P. O. PERLEY has been appointed manager New England M. Co., Bingham, Utah, in place of S. W. West, resigned.

E. H. MACDONALD of Anaconda, Mont., succeeds A. B. Knight as professor mining engineering, Montana School of Mines.

D. B. HEARD, former superintendent Hull City placer, is now superintendent Odessa M. Co.'s properties, Odessa, Utah.

ALTON L. DICKEMAN, of Colorado Springs, Colo., is in charge of the Mayne & Leonard zinc plant at Park City, Utah.

ALVIN PHILLIPS of Denver, Colo., has returned from Lake City, Colo, where he had been examining some mining properties.

A. CHESTER BEATTY has returned to Denver, Colo., from Old Mexico, where he had been examining some mining properties.

GEO. S. OLIVER is chief engineer of the Nevada-California-Oregon Railway, headquarters at Reno, Nev., succeeding C. P. Keyser.

A. M. WELLES, consulting engineer, of Denver, is making a trip through Idaho and Montana, examining some mining properties.

C. C. BRAYTON of California has gone to Dawson, Yukon Territory, to begin dredging work on the bars of the upper Yukon river.

T. L. ODDIE, general manager Tonopah M. Co., accompanied by President Brock, has arrived at Tonopah, Nevada, from Philadelphia.

HENRY KEY, construction superintendent Adventure mill, Houghton, Mich., has declined a similar position with the Victoria mill.

G. W. FRANKLIN of Durango, Colo., an owner in the Fannie Marie at Glencoe, Cal., is in Mokelumne Hill, Cal., inspecting the property.

W. J. PRISK, formerly Supt. Guffey mines, Nova Scotia, is the new Supt. Sinker tunnel, Silver City, Idaho, succeeding Fred Irwin.

M. BRADLEY is now manager of the Lion G. M. Co., operating the Bradshaw mining group, Cherry Creek district, Yavapai county, Ariz.

JULIAN SONNTAG, manager Giant Powder Co. of San Francisco, has returned from Salt Lake City, Utah, where he established a local agency.

A. M. SQUIRE of Sonora, Cal., is locally representing recent Los Angeles purchasers of quartz and placer claims near Columbia, Tuolumne Co., Cal.

J. M. GRAOG has returned to Dillon, Mont., from the U. S. of Colombia, S. A. He got considerable gold and a fever there, and is getting rid of both, preparatory to returning.

FRED IRWIN is now Supt. Dewey mine, Thunder Mountain, Idaho. J. B. Mattenson, formerly foreman Sinker tunnel, Silver City, Idaho, takes the same position with Mr. Irwin.

C. M. FUELLER, mining engineer of Denver, Colo., has returned from a trip to Macon, Georgia, and the South. He reports everything in a prosperous condition through the South.

PROF. PALMER of the Colorado State Mining School, at Golden, is expected to be the choice of the trustees to fill the vacancy occasioned by the recent resignation of President Chauvenet.

B. W. BEGEER of Denver, Colo., is now superintendent of the Last Chance mill, at Mogollon, Socorro county, N. M. He is going to adopt "Begeer's improvement of cyanide process" at the mill.

E. E. BYRON, manager Summit M. & S. Co., Kokomo, Colo., has returned from a two months trip to San Domingo islands. He also spent several weeks in Arizona examining mining properties.

JNO. HOFFMAN AND JNO. CRAIG, University of Cal. mine graduates, left Oakland, Cal., for Kimberly, South Africa, this week, each having secured a $3000 position in the De Beers diamond mines.

B. C. RIBLET has returned from Denver to resume charge of the construction work of the aerial tramway now being erected between Grand Encampment and the Ferris Haggerty mines, Rawlins, Wyoming.

JNO. A. REED, late assistant in metallurgy at the California State University, Berkeley, Cal., has resigned and goes as assayer for an American company in Honduras. Arthur Nahl, another assistant, goes to San Salvador.

C. P. PERRIN AND H. L. SMYTH left for Berners bay, Alaska, on the 4th inst., to examine the Johnson mine. Should their report be favorable, it is probable the $1,000,000 option of the Mine Securities Corporation of New York on that property will be closed.

Obituary.

Jno. Taylor, an old and respected resident of San Francisco, Cal., died at his home on the 2nd inst., in the 76th year of his age. Mr. Taylor was born at Westport, Conn., in 1826. He arrived in California in 1849. During the course of his long and useful life he was identified with the mining industry. He founded the well-known establishment of John Taylor & Co., and was prominent in municipal affairs for many years.

Latest Market Reports.

SAN FRANCISCO, June 6, 1902

METALS.

SILVER.—Per oz., Troy: London, 24d (standard ounce, 925 fine); New York, bar silver, 52½c, refined (1000 fine); San Francisco, 52½c; Mexican dollars, 44½c San Francisco, 42c New York.

COPPER. — New York: Standard, $11.75@12.00; Lake, 1 to 3 casks, $12.25; carload lots, $12.00; Electrolytic, 1 to 3 casks, $12.00; carload lots, $11.75; Casting, 1 to 3 casks, $12.25; carload lots, $11.25. San Francisco: $14.00. Mill copper plates, $17.00; bars, 18@24c. London: £54 per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £11 6s 3d per ton.

SPELTER. — New York, $4.87; St. Louis, $4.00; London, £18 5s per ton; San Francisco, ton lots, 5½c; 100-lb lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN. — New York, pig, $30.00: San Francisco, ton lots, 31½c; 1000 lbs., 31½c; 500 lbs., 31¾c; 200 lbs., 32c; less, 32½c; bar tin, ℔ lb, 37½c.

PLATINUM.—San Francisco, crude, $17 ℔ oz.; New York, $18 per Troy oz.

QUICKSILVER. — New York, $50.00 large lots; London, £8 15s; San Francisco, local, $46 50 ℔ flask of 76½ lbs.; Denver, $50.50. Export, $44.50.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16½c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $19.00; gray forge, $20.00; San Francisco, bar, 2.75 ℔ lb.,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $33 50; open hearth billets, $34.00; San Francisco, bar, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per bbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19.50; extra sizes higher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19.00; shingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11 75, long ton.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2½@3c ℔ lb.; blue vitriol, 5½@6½c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2½@2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 75c; cs., 80c; raw, bbl., 73c; cs., 78c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 65c; cs, 70c; raw, bbl., 63c; cs, 68c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13½c; Mineral Seal, iron bbls, 19c; wooden bbls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 16c; do., cs., 21½c; 86° Gasoline, bulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14½c; do., in cs., 21c; Lard Oil, No. 1 bbl., 60c; cs., 65c; Neatsfoot Oil, bbl., 70c; cs., 75c; No. 1 bbl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¾c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb, 7¼c; less than 500 lbs., per lb, 7½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb.

above keg price. Dry Lead—In bbls., 1 ton and over, 6¾c; do. in kegs, 7¼c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c.

ASSAY LITHARGE.—Per lb., 9c.

BISMUTH.—Subnitrate, per lb., $1.60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c; calcined, 20c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2⅛ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Recently Declared Mining Dividends.

	Payable.
Bunker Hill & Sullivan M. & C. Co., Montana; $9000	June 5
Con. Mercur G. M. Co., Utah; $30,000	June 9

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING MAY 27, 1902.

701,242.—PROPELLER—J. Aegerter, S. F.
701,124.—SYRINGE—C. F. Allen, Hueneme, Cal.
700,720.—REFRIGERATOR CASE—W. H. Ames, Watsonville, Cal.
700,721.—REFRIGERATOR CASE—W. H. Ames, Watsonville, Cal.
701,009.—LIFE BOAT LAUNCHING DEVICE—J. W. Bedford, S. F.
700,889.—REFINING ASPHALTUM—A. F. L. Bell, Carpenteria, Cal.
701,253.—BATTERY—G. S. Bennett, S. F.
700,890.—CAN SOLDERING MACHINE—H. C. Black, Oakland, Cal.
700,891.—CAN TESTING MACHINE—H. C. Black, Oakland, Cal.
700,724.—SWAGE BLOCK—B. F. Blood, Forest Grove, Or.
700,725.—FOOD CUTTER—J. A. Bone, Mayger, Or.
700,734.—BURIAL VAULT—A. B. Buren, Salem, Or.
701,149.—PICTURE HANGER—G. H. Chance, Portland, Or.
701,151.—MUFFLER—C. E. Christman, San Jose, Cal.
701,154.—NECKTIE FRAME—A. Cole, Hood River, Or.
701,258.—PEANUT ROASTER—W. P. Crane, S. F.
701,177.—OIL BURNER—E. W. Dunn, San Jose, Cal.
700,921.—SUSPENDERS—H. T. Hazard, Los Angeles, Cal.
700,928.—TRAIN ORDER BOX—I. C. Hoag, Los Angeles, Cal.
700,929.—BED BOTTOM—J. Hoey, S. F.
701,207.—CAR—R. A. Ludlow, Hanford, Cal.
700,970.—SPEED GEAR—J. D. McFarland, Jr., S. F.
701,071.—MARKING MACHINE—R. N. Moody, Aberdeen, Wash.
700,799.—UNLOADING SHIPS—A. Mullen, S. F.
700,841.—BICYCLE PUMP—E. F. Smith, Stockton, Cal.
701,098.—CHEESE CUTTER—W. J. Spillman, Pullman, Wash.
701,232.—DRAWER GUARD—Martha O. Teel, The Dalles, Or.
700,867.—LOOSE LEAF HOLDER—R. G. Whitlock, Los Angeles, Cal.
701,239.—WORKING ORES—F. D. Wood, S. F.
701,121.—POULTRY FEEDER—Z. Xevers, Santa Cruz, Cal.
701,241.—HEATER—J. N. Young, Alameda, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

BED BOTTOMS.—No. 700,929 May 27, 1902. John Hoey, San Francisco. This invention relates to improvements in hed hottome of that class in which a woven wire or equivalent support for the upper mattress is attached to a frame work, which is in turn supported upon a hedstead. It consists of a frame having side and end hars, the latter projecting over or heyond the eide rails of the hedstead, and supporting hlocks rest upon the hedstead rails, these hlocks having their outer ends flush with those of the end hars. The eide hars are holed through the end hars, and these hlocks, and the woven wire fabric stretched longitudinally over the end hars and unconneoted with the side bars, hae ite edges flush with the end hars and overhanging the hedstead rails. Elaetio cahles extend in pairs hetween the ends of the frame and linke, and draw the memhers of each pair toward each other, the memhers of adjacent paire overlapping and crossing to form eupplemental supports.

BRAKE AND BELL FOR VEHICLE.—No. 700,349. May 20, 1902. S. H. Madsen, Haywards, Cal. This invention is designed to provide a comhined hrake and heil mechanism to he applied to vehiclee and especially to hicyoles. The hrake coneists of a roller journaled hetween forke, which fork ie eupported upon a plate on clamps secured to the head of the hicycle. The roller comprises a central inelaetio oore and an elaatio eleeve surrounding it with metal hands upon the ends, and the elastic sleeve is provided with a spiral wrapping of cords to reduce the wear. A pressure plate has shoes adapted to press upon the metal end hands of the roll while a central cord-wound portion presses upon the tire. A spring acts to normally hold the shoes out of contact with the roller and a guided rod connects the plate with the hrake lever so that the device may he operated. A heli is so located with relation to the hrake roller that when the latter is hrought into contaot with the wheel tire or rim the revolution of the roller actuates the hammer of the heli and thus gives the warning.

LIFE BOAT LAUNCHING DEVICE.—No. 701,009. May 27, 1902. J. W. Bedford, San Francieco. The object of this invention ie to provide a series of horizontal tracks suitahly supported and generally disposed athwart-ehip, and having hinged sections adapted to project heyond the sides of the ship, these sections heing folded hack upon the main trank when not in use. Pivoted frames support the sections when extended, and tro ley sheaves upon the track and section, and a shifting lever swiveled upon the track sheaves serve for the purpose of moving the hoat outwardly and into position for launching.

ADJUSTABLE SPEED GEAR.—No. 700,970. May 27, 1902. J. D. McFarland, Jr., assignor of one-half to J. Bruckman of San Francisco. This invention is designed to provide a variable speed from a source of constant power. It consists of a shaft, and a sleeve slidahle longitudinally thereon, helical grooves or tongues varying in pitch form upon the periphery of the sleeve, a clutch mechanism adapted to reciprocate upon the sleeve, a meane hy which said clutch engages the tongues or grooves so as to impart a more rotary motion to the latter. Means are also provided for shifting the sleeve along the shaft so as to hring any portion of the grooves or tongues into engagement with the clutch.

CYANIDE PROCESS FOR WORKING ORE.—No. 701,239. May 27, 1902. F. D. Wood, San Francisco. This apparatus is designed to expedite the ordinarily slow process of lixiviation. The apparatus consists of a trough or containing tank through which an endless conveyor is adapted to travel, said conveyor heing transversely concaved so that the ore may he held in the concavity. A series of roliers are journaled within the trough so that the conveyor moving over the rollers is given an undulatory movement which allowe the solution within the trough to have free access to all the particies of ore oarried hy the conveyor, and there are means for suhjecting the ore to the oxidizing actin n of the air as it passes from one conveyor to another.

OIL BURNER.—No. 701,177. May 27, 1902. E. W. Dunn, San Jose, Cal. This apparatus is deeigned for hurning oil, and is especially adapted for furnaces of any description where heat is required, and may he modified to suit cooking or other stoves. It consists of a table having openinge made through the surface with flanges surrounding the openings and projecting above the table eurface. Upon the top fuel supply pipes extend above the surface and hoods are fixed above these pipes, these hoods heing closed at the top and open at the hottom, so that the vapor or oil will he discharged downwardly toward the table. Beneath the table is a closed chamher and a pipe located within thie chamher has upwardly extending pipes which discharge through openings in the hurner plate.

FOR SALE.

Fifteen-Ton Locomotive for Sale.

In good condition. Boiler 34 in. diameter; cylinders 10 in. diameter hy 13 in. stroke; fire hox 40 in. long, 30 in. wide and 26 in. high (crown sheet over hars); 136 tuhes; four 34-in. drivers; air pump, cylinder and hrake shoes. Price $1150.00. JAS. A. MCMAHON, 6 California St., San Francieco, Cal.

FOR SALE.
Large Deposits of Graphite.
Address F. W. CARTER,
Tenth and Cedar Streets,
SAN DIEGO, CAL.

FOR SALE--A BARGAIN.
3 Practically New Five-Foot Huntington Mills with Extras. All in A1 Condition.
Also, 2 New Four-Foot Frue Vanners. Absolutely New. Perfect Condition.
Address FRICOT & MILLER,
Latrohe, El Dorado Co., Cal.

Gold Mining Properties For Sale.
Two First-Class Placer Mines,
one having 20 years' record ae a producer. Both in good working condition. Terms reasonahle.
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THE CALIFORNIA DEBRIS COMMISSION, having received applications to mine hy the hydraulic process from Sam Ahtye, in the Secret Diggings Mine, near Laporte, Plumas County, Cal., to deposit tailings in worked-out pit draining into Clark or Slate Creek, and from P. J. Sheridan and E. N. Ekel, in the Lancha Plana mine, at Lancha Plana, Amador County, Cal., to deposit tailings in worked-out pit draining into Mokelumne River, gives notice that a meeting will he held at Room 96, Flood Building, San Francisco, Cal., on June 16, 1902, at 1:30 P. M.

SINCERITY pays in advertising. Tell the truth. The truth is good enough, and most people believe it.

SITUATIONS WANTED.

WANTED.—Position ae Assayer and Bookkeeper in a mine; experienced in underground work; good references; present position not deeirahle. Address Box No. 127, care of this office.

COMPETENT ASSAYER with knowledge of cysniding seeks engagement. Speake Spanieh, French, German and Italian, and will go anywhere. Address C, oare of Childs & Hansen, Aesayers, 127 W. 1st St, Los Angeles, Cal.

CHEMIST AND ASSAYER, Johns Hopkine University graduate, lately chief assayer and chemist for large mining and smelting company in Arizona, wants position anywhere as aseayer, or will partly assay and partly work in or about mine or smelter. Address O. S. W., care of Mining and Scientific Prees, San Francisco, Cal.

WANTED.—Position in mine or mill hy young man now employed in the credit dept. of office of large company in Chicago, Ill. Am quick and accurate at figures; strictly temperate, honest and industrious. Desire hy work and study to learn the mining husinese. First-clase references and full information cheerfully furnished. Address E. P. W., care of this paper.

COPPER FURNACE FOREMAN with eight years' experience at matte and hlack copper work. Best of references. Address V. H., care of Mining and Scientifio Press.

PHYSICIAN AND SURGEON with three yeare' experience in hoth emergency and general hospitale, in addition to experience in mines and private practice, wishes position in a mine. Best of referenoes. Addrees Box 126, care of this office.

CHEMIST AND ASSAYER, WITH TWENTY years' experience in mill and smelter work. Can run same. Address A. C., care of Mining and Scientific Press.

THUNDER MOUNTAIN.—A succeseful superintendent of over 15 years' experience and acquainted with this district, deeires to take charge of property there for a good company. Addrese T. M., care of Mining and Scientific Press.

MINING ENGINEER, practical miner and mill man, aceayer, etc., deeires poeition of superintendent or aesistant manager of a hig property. Eleven yeare' experience. Beet references. Now working in southern California. Address A. M. P., care of Mining and Scientific Press.

WANTED.—SITUATION AFTER MARCH 15, 1902, ae Manager or Superintendent of mine. Have had five yeare' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work. Four yeare' experienoe as manager and superintendent. Treatment of low grade ores a epecialty. Practical in every detail. State iocation of mine and salary. Beet of references. Addrese X. Y. Z., thie office.

A technically educated Mining Engineer, at preeent employed ae superintendent of mines for one of the largeet corporatione in Mexico, desiree a change of position to the United States ahout July 1st. Has had 18 years' euccessful experience ae engineer and superintendent, never having made a failure; 36 yeare of age; strictly temperate; a skilled deeigner, geologist and metallurgist, and a practical miner, as well as a hard worker and thorough husiness man. Referenoee of the highest order, including present employere. Address Supt., care this office.

WANTED.

Mine Blacksmith and Drill Sharpener to go to Hawaiian Islande—18 months. Unmarried man preferred; soher. Apply hy letter, with testimonials, to D. Y. Z., this office.

Wanted to Bond a Dry Placer Claim, One Rich in Flour Gold.

Muet he a dry proposition. Address "Placer Claim," care this office.

WANTED, for a developed mine in California, a competent mining engineer to look after development and exploration. Must he a full graduate of a recognized mining college and have had eeveral years' practioal experience in large iron, coal or copper mines, and he fully skilled in the engineering problems pertaining to extraction, haulage, ventilation, etc. Give full particulare of career, experience, age, etc, to "Vulcan," care of this paper.

WANTED.

Consulting Mining Engineer,

familiar with making examinations of mines, prospects and mineral lands. Address stating experience and referencee. Moderate salary to start, with advancement to competent man. Position permanent if found eatisfactory. Addreee A., care of Mining and Scientifio Press.

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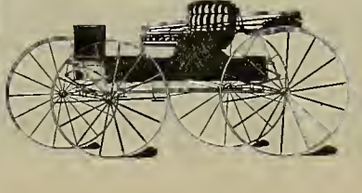

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ASSESSMENT NOTICES.

REWARD GOLD MINING COMPANY.—Location of principal place of hueineee, San Francieco, California; location of works, Pine Grove, Amador County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 28th day of May, 1902, an assessment (No. 10) of two (2) cents per share was levied upon the capital stock of the corporation, payahle immediately in United States gold coin, to the secretary, at the office of the company, Room 56, No. 309 Montgomery street, San Francisco, California.

Any stock upon which this aeeeeement shall remain unpaid on the 30th day of June, 1902, will he delinquent, and advertised for eale at puhlic auction; and unleee payment ie made hefore, will he eold on MONDAY, the 21st day of July, 1902, to pay the delinquent assessment, together with the coete of advertieing and expenses of sale.

By order of the Board of Directors.

J. STADTFELD JR., Secretary.

Office—Room 56, No. 309 Montgomery street, San Francisco, California

NATIONAL CONS. MINING COMPANY.—Location of principal plsce of hueineee, San Francisco, California; location of worke, Rich Gulch, Shasta County, Ca if rnia.

Notice ie hereby given, that at a meeting of the Board of Directors, held on the 2nd day of June, 1902, an aeeeeement (No. 16) of five cente per ehare wae levied upon the capital stock of the corporation, payahle immediately in United States gold coin to the secretary, at the office of the company, 773 Miesion street, San Francisco, California.

Any etock upon which this aeeeement shall remain unpaid on the 15th day of July, 1902, will he delinquent and advertised for sale at puhlic auction; and unless payment is made hefore, will he eold on MONDAY, the 18th day of Auguet, 1902, to pay the delinquent assessment, together with the costs of sdvertising and expeneee of eale.

By order of the Board of Directore.

GEO. W. FLEISSNER, Secretary.

Office—773 Mission street, San Francisco, California.

DELINQUENT SALE NOTICE.

SILVER KING MINING COMPANY.—Location of principal place of hueineee, San Francieco, California; location of worke, Pioneer Mining District, Pinal County, Arizoca Territory.

Notice.—There are delinquent upon the following deecribed etock, on account of asseeement (No. 24) levied on the 17th day of April, 1902, the several amounts eet oppoeite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
J. O'B. Gunn	3679	350	$350 00
Michael Levy	7352	100	100 00
Michael Levy	7354	100	100 00
F. Avery, Truetee	7415	100	100 00
New York Issue.			
James Entwistle	1010	100	100 00
Jamee Entwistle	1011	100	100 00
Jamee Entwistle	1012	100	100 00
Jamee Entwistle	1013	100	100 00
Jamee Entwistle	1014	100	100 00
Nathan May	1016	100	100 00
Nathan May	1017	100	100 00

And in accordance with law, and an order from the Board of Directors, made on the 17th day of April, 1902, eo many shares of each parcel of such stock ae may be necessary, will he sold at public auction, at the office of the company, No. 310 Pine street, Room 36, San Francisco, California, on TUESDAY, the 24th day of June, 1902, at the hour of 1 o'clock P. M. of said day, to pay said delinquent asseeement thereon, together with coets of advertising and expeneee of sale.

J. W. PEW, Secretary.

Office—No. 310 Pine street, Room 36, San Francisco, California.

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N. B.—Use the same judgment when huying a vehicle that you exercise when selecting seed wheat or developing a mine.

MINING AND SCIENTIFIC PRESS.

Whole No. 2186.—VOLUME LXXXIV. Number 24. SAN FRANCISCO, CAL., SATURDAY, JUNE 14, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Improved Automatic Tailings Sampler.

Herewith are illustrations of a device for cutting out samples coming from tailings from wet crushing stamp or other pulverizing mills, concentration works, any system of ore treatment where the tailings are sluiced from the mill.

Figs. 1 and 2 represent the sampler as used in mills treating free milling ore, the sampler being placed below and receiving the overflow from an ordinary amalgam trap.

The advantage of having an accurate and systematic sampling, with subsequent analysis, of the tailings discharged from any mill is obvious. It is an absolute necessity in working many low-grade ores where the margin of profit is so limited that the utmost skill and vigilance are required in order to enter the returns upon the proper side of the balance sheet. The character of accurately obtained samples is a true exhibit of the efficiency of the methods of ore treatment employed. It goes without saying that the average mine owner knows to a nicety the values that are recovered and the approximate values originally contained in the ore, but it is of equal importance for him to know how much of this latter amount is lost through any incompetency or carelessness of mill employes, from changes in the character of the ore coming from different levels, from the employment of hattery screens of improper mesh, or from unsuspected causes. The employment of an efficient sampling device furnishes a means of accurately recording these fluctuations, in many cases indicating the remedy and enahling the superintendent to present a more comprehensive record of the mill run.

The device herein described consists primarily of a hopper containing a narrow trough-shaped hox, deeper at one end and attached to an oscillating tipple actuated by means of a small stream of water discharged through a ¾-inch pipe at low head. With each oscillation of the tipple the box passes laterally through the constant flow of tailings coming from the amalgam trap, sluice box or other means of discharge, thus receiving the entire flow for a brief period of time and discharging the same through a pipe projecting from the side and leading into a pail or other convenient receptacle. The tipple rests on knife edges similar to those employed in the mechanism of the ordinary weighing scales, and is divided into two compartments hy means of a central partition forming a part of the casting.

In operation, the water flows into one of the compartments until the sheer weight of the accumulated water causes the tipple to gravitate towards that side, the water siphons out and is discharged into the tailings hopper, while the other compartment receives the flow of water until the operation described is repeated. The interval of time elapsing between the taking of each sample is regulated solely hy the flow of the water into the compartments, and can be adjusted to suit any requirement. Several samples may be taken every minute, or samples may be taken every hour or fractions thereof, at the will of the operator. This is a feature of the device that will commend itself to practical mill men.

This sampler is fully protected by letters patent and has heen placed on the market by the Union Iron Works of San Francisco, sole manufacturers thereof.

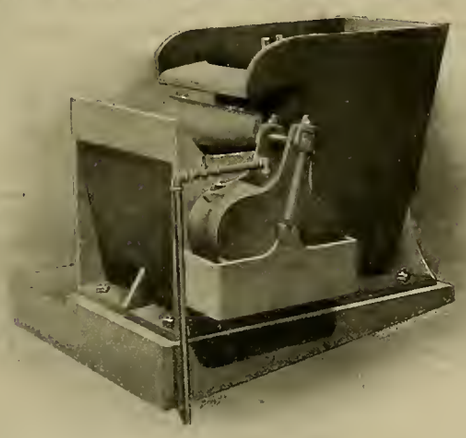


Fig. 1.—Improved Automatic Tailings Sampler.

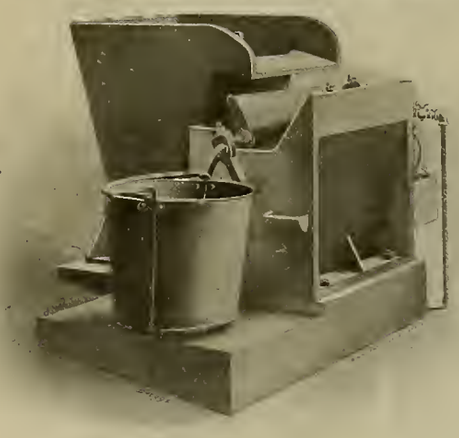
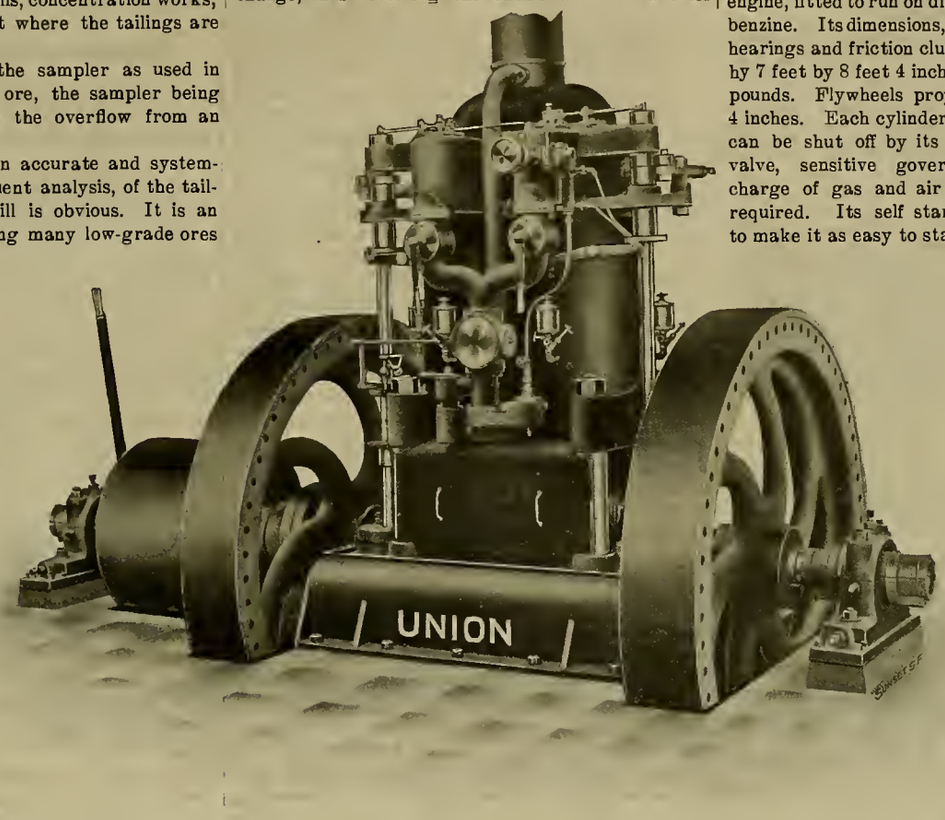


Fig. 2.—Improved Automatic Tailings Sampler.

Eighty-Five H. P. Union Gasoline Engine.

The accompanying illustration shows the latest type of 85 H. P. double cylinder Union stationary engine, fitted to run on distillate, naphtha, gasoline or benzine. Its dimensions, including flywheel, outboard hearings and friction clutch pulley are 15 feet 5 inches hy 7 feet by 8 feet 4 inches high; total weight, 29,600 pounds. Flywheels project helow engine hed 2 feet 4 inches. Each cylinder is independent, and either can be shut off by its throttle. It has a douhle valve, sensitive governor, which graduates the charge of gas and air in proportion to the power required. Its self starting apparatus is designed to make it as easy to start as any steam engine, compressed air being used through the valve shown on the head of engine. A small centrifugal pump is used for circulating water from a tank around the cylinders and heads, which are completely water-jacketed, and hack to the tank. The inlet and exhaust valves are opened mechanically hy cams and levers. The fuel is pumped by a small hrass plunger pump, operated by an eccentric on one of the side shafts, and is supplied to the vaporizer only as needed hy the engine. Any surplus fuel pumped returns to the oil tank. The crank throws are at angles of 180°, so that the pistons and connections are perfectly halanced. One of these engines is running a 40-stamp mill of the Progresso M. Co., Triunfo, Lower California; another is operating a rice mill in Honolulu, and another, with marine attachments, is just completed for Messrs. Vail & Vickers of Los Angeles, Cal., who are building a vessel in which to install it. The speed of this engine is 250 revolutions per minute. It is a fine electric light engine.



Eighty-Five H. P. Union Gasoline Engine

These engines are huilt by the Union Gas Engine Co., offices and works at First and Clementina streets, San Francisco, Cal.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

Chicago Office.....737 Monadnock Blk.
Denver Office.....606 Mack Blk.

J. F. HALLORAN.....Publisher.

San Francisco, June 14, 1902.

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THE amount of capital invested in electrical enterprises reaches totals that are noticeable. The progress of electrical science during the past twenty years excels that of any other industry. The capital invested in electric lighting aggregates $750,000,000; in telephones, $400,000,000; in telegraph, $250,000,000; in electric railroads, $2,000,000,000, a total of $3,400,000,000 in the United States alone. Over 500,000 employes are on the pay rolls.

IT does not follow that because the number of stamps in a quartz mill is doubled that the gold output value will likewise be doubled. Doubling the number of stamps will rarely increase the gold output more than one and three-quarter times what it was when one-half the number were dropping. Usually this is because there is less selection of ore; more is fed to the stamps, but it is not of so good quality. Where ore fed to a 10-stamp mill will go $20, when the stamps are increased in number to twenty, the same mine will ordinarily send ore that goes about $15. On the other hand, doubling the number of stamps will often insure decreased cost. Where with a 10-stamp mill the cost of mining per ton is, say, $2.50; of milling, 85 cents; of general superintendence, 60 cents; of maintenance and repairs, 10 cents; of general office, taxes, etc., 24 cents, with a 20-stamp mill these same items would be about $1.50, 60 cents, 30 cents, 8 cents and 5 cents, respectively—$4.29 : $2.53.

IN Congress on the 11th inst. Senator Kearns of Utah, from the Committee on Mines and Mining, reported a bill amending the laws relating to the location of mineral lands. The amendment gives locators the exclusive right to possession of all the surface land within their lines, and of "all veins, lodes, etc.," throughout the entire depth which lie within such surface lines extending downward vertically. Locations are to be 1500 feet square in all cases in which previous locations do not prevent. The existing legal provision concerning tunnels is repealed. The present law in regard to locations gives an area of 600 by 1500 feet, but permits owners to follow the vein outside the lines. The effect of the proposed amendment would be to extend the area and to confine mining within the surface lines vertically extended. It would sweep away all extralateral rights, and is in line with the requirements of modern economy, but will not be likely to pass while Stewart of Nevada is in the Senate. He long since arrogated to himself the right to say what should and what should not constitute change in mining law, and "senatorial courtesy" has continued to concede the privilege that he has so often abused.

The Point of View.

The value of the services of a mine manager depends somewhat on his own estimate. If one can establish his value the world is ready to pay him the price he sets on himself. Just what to charge is often relative and comparative. Last week a California mine manager who is now paid $5000 per year was discussing with the writer the advisability of accepting a $9000 offer to go to South Africa. He figured it out this way: "What I am getting now is about my limit. I don't think I am worth more, that is, here in California; to go to South Africa means increased risk, it means greater effort; it should be worth more. The question is, Am I equal to the adventure? Then, five years in South Africa will age me more than ten years in California, and I ought to take that into account." This man had things "sized up" about right. A Colorado miner whom the writer met in Denver last April viewed the same matter from a different standpoint. He was paid $400 per month, and had an offer to go to Chile at $750 per month. He said: "To stay here means just that much, right along, and probably no more; to go to Chile means increased expense, poorer living, possible privation at times, a sort of exile from much that is agreeable, and the question is, Does the extra $350 per month justify the extra effort?" He also had the main idea. In such cases the possibilities of the future enter largely into one's thought even without his knowing it. The chance of there being something more than the mere salary, the consciousness that he may seize the skirts of happy chance and climb to fortune often impels one to accept a foreign offer when the salary in itself would not be a sufficient set-off to the added risk. Then comes the innate wish of every competent man to have a wider field of action, and comes, also, that strange and irresistible attraction that has ever impelled men to seek fortune in newer lands. And comes to mind in many such cases, the princely pay that many eminent American mining engineers have received in other lands, coupled with the thought, "I am as competent as So-and-So, who got $35,000 per year, or So-and-So who got $60,000. Pull or influence may get a place, but merit alone can hold it. I'll take it, and, perhaps, in two or three years, I, too, may demonstrate my ability and be able to get as big a salary." And right here we come back to the idea or fact stated in the first two lines. For the value that one sets on himself is often just the value in which he is held by the world, or that small part of it with which he is concerned. "I am offered $6000 a year and expenses and a two years' contract to go to Rhodesia," said a mining engineer to two of his friends some years ago. "Ask just double that; they'll think all the more of you," was the advice of one of them. He did so, and got it. There's something in that, and it is not solely confined to the ranks of mining engineers.

PEOPLE who turn their eyes away from an article where they see a line of chemical signs or symbols, and who duh such things "scientific gibberish," little think how chemistry contributes to their safety and comfort and profit. No department of practical science, not even metallurgy or electricity, shows greater progress in value than chemistry. If "beauty is its own excuse for being," then chemistry needs no excuse. It is the foremost factor in engineering and fills the field in many important daily duties. Mining and metallurgy of to-day are founded on chemical discovery; railroading, bridge building and manufactures in general depend upon chemistry as a base. The science of chemistry ministers to the daily wants of the miner and metallurgist, helps him to make money and preserves him from the perils of his occupation. Chemistry has made progress possible, and without chemistry the geography of the twentieth century would differ little from that of the eighteenth. In any large establishment the chemist has now a place recognized as of prime importance. Upon his skill and judgment depends many times whether the concern shall run at a profit or a loss. To make one illustration: In railroads of this country what is known as the Burlington system is prominent. It is a good road skillfully handled. Mr. Clark, the superintendent of motive power, writes that in the chemical laboratory of the road in Chicago during 1901 there were chemically tested and analyzed samples of axles to the number of 13,259. That may seem an unnecessary number of chemical analyses of axles, but anyone who has ever seen a railway disaster caused by a broken car axle will not think so. If these 13,259 chemical analyses of axles designed for railway use prevented one railway horror, it was time and money and skill well spent. During the year the same laboratory made chemical tests of cement 171 in number; of copper, 34; iron, 501; lead, 12; oil, 17; phosphor-bronze, 28; soda ash, 2; steel, 1817; coal, 33; paints, 24; water, 46—all this, of course, as a business proposition, illustrating the wide scope of railway management and the recognition of the economic importance of the chemist. Similar illustrations could be given in other departments of business throughout the country.

Assessing Unpatented Claims.

In our February 15 and April 26 issues the taxation of possessory claims was treated editorially. While any opinion this journal may give will not alter existing law, it may have effect in calling attention to a law unpopular, if not unjust. While the amount of the tax may be small in individual instances, it is large enough in others to be a burden on the prospector. The amount is dependent upon the valuation fixed by the assessor and the rate of taxation. In one California county, a valuation of an unproductive and undeveloped location was $500, the tax rate $2.50, the tax $12 50; in another county a claim, similarly undeveloped, was valued at $200, which with the rate of $2 made $4 tax. California possessory claims are taxed under the State law, but it seems it is not universally done, in fact it is not of common occurrence. From this it is concluded it is largely a matter resting for action with the assessor. It certainly is an unpopular measure, and possibly few of the assessors care to so offend their constituents as to enforce collection, as the payment of the tax is more often refused than made.

Within the last few weeks, several locations delinquent for taxes have been sold by the sheriff to the highest bidder; the State will give the buyer a deed to the claim. It will be the duty of the State to place purchaser in possession. Should the original locator forcibly oppose the attempt to place the purchaser in possession, it is not easy to say to what extent he would be justified in such opposition, nor how far the federal Government would protect the rights derived therefrom. It is difficult to see what rights or titles are thus conveyed by the State. The purchaser is presumed to take possession and acquire the same rights as were held by the late owner. But none of these rights have been conferred by the State. The federal Government agrees with the locator of a claim to sustain his possessory rights as long as he shall perform certain acts, and guarantee his right as against all comers. The U. S. Government conveys no title, it simply gives the protected privilege or sole right to prospect, develop and receive all benefits therefrom. Title rests in the United States and the claim is Government property until the further requirements for patent shall have been complied with, when title is transferred to the locator; the property then becomes real estate, and as such is liable to taxation.

The State may make laws relating to mining rights, but such laws may not conflict with the federal laws. Here certainly there would seem to be conflict. As the possessory right is derived from the U. S. Government, it is not plain how such right can be impaired or jeopardized by other than that Government.

As has been suggested in this journal, it is more than probable, if any person should make a test of this State law, the decision would be adverse to the law as it now stands.

THE consumption of copper has never been so large as at present, and every pound bought in New York as well as all that has been shipped abroad during the past six months has been actually consumed. The last week in May one firm sold 8,000,000 pounds; of this probably a very small quantity only went into speculative hands. Eastern opinion is that the U. S. Metals Selling Co. is trying to hold the price under 13 cents. It is asserted that it sold its entire output to June 1st at 11 cents; for July at 12 cents, and the output for August for 12½ cents.

Concentrates.

THE bucket elevator gold dredger originated in New Zealand twenty years ago.

THE addition of nickel to steel is to prevent crystallization.

THREE candles to a shift is the average, though four or even more would be required in draughty places.

THERE is no material advantage in having the exciter for an alternate generator run by a separate water motor.

MINERAL LANDS in forest reserves are subject to location and entry under the general mining laws in the usual manner.

A CYLINDRICAL wooden dam, with a radius of curvature of 30 feet, to resist a maximum water head of 200 feet should be 7 feet thick.

A LODE, LEAD, LEDGE OR VEIN is a plane of mineralized rock traversing a rock formation, but formed at a later period than the rock formation.

THERE is no silver mine being worked at present in California. Much of the gold produced, however, would involve the production of from 5% to 8% silver, if it were saved.

OF the three constituents of granite—feldspar, quartz and mica—the first named is the great clay maker. It disintegrates readily, loses soda and potash and soon becomes clay.

CHROME has been and can be produced in any desired quantity in California, but its slight demand and its coming as ballast in Atlantic vessels precludes profitable development.

A MACHINE DRILL will drill a 1 to 1½-inch hole 4 to 7 feet deep in one hour, depending upon the character of the rock, at a cost of 30 to 50 cents per lineal foot, labor $2 50 per day.

TAKING the standard of air compressor at sea level as 100, the barometer standing at 30 inches, at an altitude of 9000 feet, the efficiency would be 75.1%, the barometer standing at 21.22 inches.

A PIPE LINE with an area of 144 square inches, 2000 feet long, on a slope of a 10% grade, when full of water, would have a pressure of 86.8 pounds per square inch at the bottom of the pipe when full of water.

THE Government bonus for the manufacture of pig lead from Canadian ore in Canadian territory is $5 for each ton of refined lead so produced during 1902; $4 during 1903; $3 in 1904; $2 in 1905, and $1 in 1906.

"WRITE-UPS" of mining properties are valueless. They are ordinarily fulsome and unreliable, pleasing only those who want notoriety. The truth is generally good enough, and an exact statement of facts is more effective in every way.

BOILED LINSEED OIL can be made "at home." Boil the raw oil in open iron kettles, raising the temperature of the boiling oil to 450° F. If without a pyrometer to determine that degree of heat, stop boiling the oil when it is hot enough to scorch a feather.

THERE is practically no difference between electrical "generators" and "dynamos," except the first term is reserved for the larger sizes of machines such as are used in power station work, while any electro-magnetic machine producing electricity is a dynamo.

TO ASCERTAIN the diameter, speed or power to be transmitted in wrought iron shafting, D = diameter in inches, H = horse power to be transmitted, r = revolutions per minute: Diameter $D = \sqrt[3]{\frac{H \times 125}{r}}$.

OWNERS of valid mining locations made and held in good faith under the mining laws of the United States are authorized to fell and remove from such mining claims any timber growing thereon for actual mining purposes in connection with the particular claim from which the timber is felled or removed.

THERE are about 2000 different "minerals," but only about forty are of any likely importance to the miner or metallurgist. A "mineral" may be considered as an inorganic substance with a definite chemical composition, being composed of a single element or of several elements united in the form of a compound.

THE average rate of drilling with a diamond drill may be taken as 7 feet per hour, at a cost of $1 per foot, depending upon the character of the rock and depth to which boring is carried. These figures are based on average depths of 180 feet; for deeper holes in ordinary rocks 3 feet to 5 feet per hour and $1 to $2 per foot.

IF the cable splicer should find that his hands perspire too much for handling the paper-covered conductors, he can obtain dry hands by washing them in alum water. Where the weather is extremely hot, a mixture of paraffin and beeswax, in about equal proportions, will make a harder mixture and prove more satisfactory than paraffin alone.

BLUE PRINTS can be made waterproof by being immersed in melted refined paraffine. A good way to fix that kind of work is to get a dozen or so pieces of absorbent cloth, about 12 or 14 inches square, immerse them in melted paraffine until saturated, and after cooling they are ready for use. When it is required to waterproof a blue print spread one of the pieces of saturated clothe on a smooth surface, lay the dry blue print on it, put another saturated cloth on top and go over it with a moderately hot flatiron. The blue print will absorb the paraffine, will become translucent and thoroughly waterproof.

A CHARGE for galena and carbonate ore in fire assays could consist of a flux composed as follows: Pot. carb., K_2CO_3, 16 parts; sod. bicarb., $NaHCO_3$, 16 parts; flour, 5 parts; borax glass, $Na_2B_4O_7$, 8 parts; 5 grams ore mixed with 20 grams this flux in a 5 or 10 crucible and 20 grams more flux added as a cover with two or three nails for the galena ore.

THE words "chute," "shoot" and "shute," while nearly synonymous, are variously but confusedly used. "Chute" is a French word meaning shoot. "Shoot" is more commonly used to denote the pay rock or ore shoot; "chute" a wooden channel or box or a raise through which rock or timber (in the first case) are sent down to a bin or other convenient place; "shute" is rather uncommon.

THE word "banket," often used in referring to South Africa and Australia mines, is an auriferous alluvial conglomerate, in which the gold is said to have been precipitated from percolating waters. "Banquet" or "banket" is primarily a place of deposit of precious metals, which is probably the origin of the term. "Blanket" vein is generally applied to veins or deposits lying flatter than 45°.

ANY salt of soda is soluble in water, especially so in warm water. Soda salts precipitate only from saturated solutions, are not volatile, and hence soda may be found in the condensation, the cylinder and entire steam system, though dry steam does not contain nor carry soda, it being the moisture that holds the soda in solution. Tannate of soda is probably the best salt of soda for steam boiler use, when mixed with about four times its weight of tannin.

CHLORIDIZE and chlorinate are synonymous in that the ultimate result is the same, the combining of chlorine with a base forming a chloride. The term "chloridize" is applied to that operation where a chlorine compound, as salt, is added to an ore and the mixture roasted or otherwise treated, in contradistinction to chlorinate, where chlorine gas or chlorine water is caused to pass through the roasted ore, combining with the gold, forming chloride of gold.

IN such a coal mine explosion as that at Fernie, B. C., the change that takes place in the air of the mine at the moment of the explosion is as follows: The oxygen of the air is consumed, and immediately large quantities of carbonic oxide gas (CO) and carbonic acid gas (CO_2) and moisture are produced. The nitrogen of the air remains unchanged. All these gases form a deadly mixture, which is the afterdamp of the explosion. This is more destructive to life than the force of the explosion itself, as it suffocates all animal life.

DISCOVERY is the source of the miner's title. There can be no valid mine location without actual discovery of the vein or lode. A placer claim can not be "maintained by location on a porphyry dike." When the locator of a quartz lode finds rock in place containing mineral he has made a discovery within the meaning of the statute, whether assaying high or low. As to the tunnel site, the court decisions thereon are so conflicting that it is impossible to make any statement that could not be successfully contradicted. The better way is to go strictly by Sec. 2323, United States Revised Statutes.

GAS ENGINES are governed in two ways: First, by missing one or more working strokes, and, second, by varying the proportion of air and gas composing the explosive mixture, so that the explosions will become subdued as the speed of the engine increases, and heavier when the speed is decreased. The latter method is capable of producing a uniform speed with somewhat better economy and less weight in the flywheels, and is being given considerable attention by inventors. The throttling of the gas is performed by a governor driven from the main or auxiliary shaft and operating a suitable gas valve. The governor is frequently of the flyball type.

THE Tonopah, Nev., ledges are covered by a lava flow and, with possibly a few exceptions, there is no outcrop. Discoveries of the ledge are made by sinking through lava; 100 to 175 feet is the general thickness of this flow. In order to make a location, notices are posted announcing the intentions of the claimant. Should another sink on the same ground and discover the ledge first, he is entitled to the ground by right of first discovery. The first claimant must take such chances. Generally, the first comer's rights or presence are recognized and due diligence in his work is respected. In such a formation claims can not be located as placers nor as quartz locations are ordinarily located. Discovery alone gives a clear title. After the course and dip of the ledge are ascertained, the same may be extended to the surface and the boundaries of the claim marked.

IN modern manufacture of sulphuric acid sulphur or pyrites is burned in suitably constructed furnaces, the gases from the sulphur being brought in contact with nitric acid and then condensed in large lead-lined rooms, making the sulphuric acid of commerce. Production of muriatic acid is carried on by adding sulphuric acid to salt, which evolves gas, which is passed through earthen vessels partially filled with water, which absorbs the gas and gives the commercial muriatic or hydrochloric acid. Further distillation of the commercial hydrochloric acid gives C. P. muriatic acid, used by chemists and assayers. Manufacture of nitric acid is difficult and dangerous. It is carried on in sealed retorts, wherein sulphuric acid and nitrate of soda are charged, and by direct fire heated up until the gases are driven off in the form of nitric acid vapor, passing through earthen jars where the same is cooled off, the gases condensed, leaving the jars commercial nitric acid.

TO DETERMINE the amount of lead in an ore where because of an unusual percentage of copper the ordinary fire assay is not satisfactory, the ore or matte is first treated with nitric acid, the solution then diluted and filtered, precipitation effected by sulphuric acid, throwing down sulphate of lead, sulphate of baryta, sulphate of strontia and sulphate of lime. The precipitate is then washed down to the point of the filter with water, to which two drops of sulphuric acid are added, then dried. The dry precipitate is placed in a small clay annealing cup, the filter ignited, the ashes added to the precipitate in the cup. Cyanide of potassium equal to about five times the weight of the precipitate is then added and the whole of the contents of the cup fused at a low heat over a spirit lamp. The lead sulphate is soon reduced to metallic lead, settling in the bottom of the cup. The cup is allowed to cool, and then, with the contents, placed in a porcelain dish with water. The cyanides then dissolve, leaving the metallic lead, which is dried and weighed.

IN the North Queensland, Australia, slimes treatment, the slimes are trucked down to the works, and the required quantity of quicklime to neutralize the acid contained in them is added as the trucks are emptied into a hopper discharging into a disintegrator. The lime required per ton of dry slimes varies from twenty to sixty pounds. After passing through the disintegrator, the powdered mass is raised by a bucket elevator to a top hopper, which discharges into side-tip trucks running over the tops of the vats. Over each vat is a 6-inch centrifugal pump, the suction pipe of which descends at an angle to within 2 feet of the bottom of the vat, the discharge pipe continued down to the floor of the vat, where it terminates by a right angle bend on a swivel point, so that the flow can be directed across to any part of the vat. The vat being filled with solution of cyanide, the centrifugal pump is started, and in a few minutes the whole mass of liquor is in violent agitation. Into this agitated liquor the powdered slime is dropped, truck by truck, until the whole charge, amounting to ten tons, is delivered, the agitation being maintained the whole time. A few minutes after the last truck is dropped in the pump is stopped and the whole mass allowed to settle; this occupies twenty minutes, the solution being left absolutely clear on top. A pipe, mounted with swivel joint, and connected with the pipe service leading to the zinc extractor boxes, is then gradually lowered till the whole of the supernatant solution is drawn off. The vat is then filled with the weak solution, and the pump again set in motion; in a few minutes the whole mass is once more stirred up and the first process repeated. After the second solution has been drawn off clean water is added, and after the mass is thoroughly worked a plug in the bottom of the vat is opened and the thin stuff run off in wooden launders, whence it is raised and delivered away by a large centrifugal pump.

FEET multiplied by .00019 equals miles; yards multiplied by .00063 equals miles; square inches multiplied by .00695 equals square feet; circular inches multiplied by .00546 equals square feet; square feet multiplied by .111 equals square yards; acres multiplied by .4840 equals square yards; square yards multiplied by .0002066 equals acres; width in chains multiplied by .8 equals acres per mile; cubic feet multiplied by .03704 equals cubic yards; pounds multiplied by .009 equals hundredweight; pounds multiplied by .00045 equals tons; cubic foot of water multiplied by 62.5 equals pounds avoirdupois; cubic inch of water multiplied by .03608 equals pounds avoirdupois; cylindrical inch of water multiplied by .02842 equals pounds avoirdupois; cylindrical foot of water multiplied by 49.1 equals pounds avoirdupois; cubic inches multiplied by .004329 equals U. S. gallons: cylindrical feet multiplied by 5 874 equals U. S. gallons; U. S. gallons of water multiplied by 13.44 equals one hundredweight; U. S. gallons of water multiplied by 268 8 equals one ton; cubic feet of water multiplied by 1.8 equals one hundredweight; cubic feet of water multiplied by 35.88 equals one ton; cylindrical foot of water multiplied by 5 875 equals U. S. gallons; diameter of a circle multiplied by 3 14159265 equals circumference; diameter of a circle multiplied by .8862 equals side of an equal square; diameter of a circle multiplied by .7071 equals side of an inscribed square; square of a diameter multiplied by .7854 equals area of circle; circumference of a circle multiplied by .31831 equals diameter; side of a square multiplied by 1.128 equals diameter of equal circle; square foot of an area multiplied by 1.12837 equals diameter of equal circle; square of the diameter of a sphere multiplied by 3.1416 equals convex surface; cube of the diameter of a sphere multiplied by .5236 equals solidity; diameter of a sphere multiplied by .806 equals dimensions of equal cube; diameter of a sphere multiplied by .6667 equals length of equal cylinder; cylindrical inches multiplied by .0004546 equals cubic feet; cylindrical feet multiplied by .02909 equals cubic yards; lineal feet multiplied by .00019 equals statute miles; lineal yards multiplied by .000568 equals statute miles; column of water 12 inches high, 1 inch diameter, equals .341 pound; 183 346 circular inches equals 1 square foot; 2200 cylindrical inches equal 1 cubic foot; French metres multiplied by 3.28 equals feet; kilograms multiplied by 2.205 equals avoirdupois pounds; grams multiplied by .002205 equals avoirdupois pounds; square of diameter of cylinder in feet multiplied by depth in feet and by .14 equals barrels of 42 gallons.

Auriferous Gravels and Hydraulic Mining.*

By W. S. WELTON.

Cemented gravel, although hard, will disintegrate in water; its hardness is evidently due to compression. It is generally richer in gold than in other gravels. The hydraulic method has been found to be economical for working gravel deposits when of considerable depth and sufficiently above the level of a valley to admit of a discharge for the tailings. A supply of water, not less than 500 miners' inches, with a head of not less than 200 feet, is required; with an increased water supply and greater fall the advantages of the hydraulic system are more notable. An economical deposit for working is one having a depth of 150 to 200 feet. Beyond this depth it is necessary to work the deposit in two benches; when the bank is low, the cost of working is increased by the necessity of frequently advancing the sluice and pipe lines to reach fresh ground. It is advantageous to carry the working face the full width of the channel, that there may be considerable space of cleaned-up bedrock behind the hydraulic monitor for the deposit of debris, and thus obviate the necessity of having to handle these a second time. With a wide face the cost of advancing the sluice is less in proportion to the amount of gravel washed.

With the hydraulic jet a certain amount of skill is required in the pipe man to make the best use of it, some men piping down and washing twice as much dirt as others, working with the same monitor. The main objects to have in view are to keep the sluice continually running with the full amount of dirt that it will carry, and, at the same time, to combine the fine dirt with the boulders, as the stream will then run off boulders which would not move with clear water, and the continued running of gravel is considered to prevent the loss of gold in the sluice.

To those accustomed to dressing operations in the concentration of minerals and the necessity of sizing the particles of ore to obtain the best results, it may appear impossible that small grains of gold should remain in a sluice through which so large a supply of water is running with a velocity powerful enough to carry down boulders; but, under the above conditions, a sluice with wooden blocks will catch a large proportion of the finest grains of gold; the boulders, in rolling down the sluice, keep the material in a constant tremor by striking the blocks as they rapidly turn over; this apparently produces an effect in the sluice similar to that of the hammers on a packing sieve (a large tub used by Cornish miners for the final concentration of tin ores), and the belief of some hydraulic miners that, when the sluice runs clear water, or no boulders, a loss takes place by the water boiling the gold out of the riffles, appears to confirm the above theory.

With respect to the smallness of the grains of gold recovered in a sluice, it may be mentioned that, after a second straining of the quicksilver through double unbleached calico, a sediment of amalgam will be found in the quicksilver tanks after these have been stored a few weeks.

With regard to the sluice, a grade of 6 inches in 12 feet is the most usual; but, if the water supply is large, this may be reduced. The rule appears to be that the grade must not be so small as to allow of the riffles being rapidly filled with black sand, as the gold will then float over them.

The author has obtained a better result from cleaning up the head of the sluice every four weeks than by running a longer period; and he attributes the relatively inferior results from long runs to the riffles filling with heavy sand, in consequence of which a portion of the gold is carried down to the lower portion of the sluice and undercurrents.

The best extraction of gold will depend upon the condition of the sluice and the manner of blocking it. The sluice may be either paved with square blocks, cut across grain, or with the slightly flat quartz boulders found in the gravel. Blocks may be of any size and from 8 to 12 inches long. They are placed on end in the sluice in parallel rows, set apart from 1 to 1½ inch by means of strips of wood 2x1½ inches, squarely placed upon the bottom of the sluice, with their ends secured under the sluice lining, which is kept 1½ inch above the bottom for this purpose. The cross-channels thus formed are termed riffles. In rock pavement the interstices between the rocks form the riffles, and the rocks are placed on end and inclined about 70° up stream, then wedged by driving small pebbles into any vacant spaces. A trial of the relative advantages of rocks and blocks, and the distribution of gold in the sluices, was made at the Colombian Hydraulic Co.'s mines, South America, the sluice being paved alternately with rocks and blocks, and the gold-amalgam collected from each section separately on cleaning up the entire length of sluices. There were no undercurrents, as they require a fall of about 8 feet each, and there was no grade to spare. The sluice generally had a grade of 6 inches to 12 feet. The following are the results which were obtained:

Feet.	Distance From Head of Sluice.	Amalgam Obtained. Ounces	Equal to Per 10 Feet of Sluice. Ounces.
216	rocked, grade 6 inches	137	6.342
163	blocked "	300	18.405
502	cut in rock, without sluice, but cleaned down	...	.....
436	rocked, grade 6 inches	120	2.752
310	blocked "	305	9.838
1,135	rocked, grade 9 inches	23	0.202
579	blocked, "	20½	0.354
3,341		905½	

A quantity of free gold, some of which was rusty, was found in the upper portion of the sluice; less in the blocked portion below; then a much larger portion—probably one-third—below this; and in the last 1714 feet nearly all the gold was free and in thin scales, as if much worn.

The result of the experiment was in favor of blocking the sluice, the relative value for catching the gold being: Blocks, 75.4%; rocks, 24.6%.

Rocks, however, used in a sluice for carrying off tailings may prove economical for this purpose, as they last a long time. A rocked sluice should have 50% more grade than a blocked one, if required to carry the same quantity of dirt.

The undercurrents receive the gravel minus the boulders which have been separated from the dirt by the grizzly. It might appear well to give these less grade than the sluices, to allow the light gold to settle. This is not the practice, however, and undercurrents have double the grade of the sluice; but, taking into account their extra width and relatively diminished force of water, they may be considered to be working under similar conditions to the sluices. Only the heavier sands remain on the undercurrents, and these would quickly fill up the riffles and allow the gold to flow over them if the grade were less than it is. Fortunately, the heavy sands are in small cubes, which roll faster than the gold, which is in thin scales, and this appears to allow of the concentration of the gold in the riffles with small loss. Then, the riffles being shallow, the quicksilver remains more on the surface in contact with the gold than in the deep riffles of the sluices.

From the small proportion of gold found amalgamated in sluices, it may be inferred that the riffles are instrumental in collecting it. It is difficult to prevent quicksilver settling down to the bottom of the riffles, and a trial was made of inserting shallow troughs of quicksilver into the riffle spaces; these collected most of the gold in a short distance from the head, but the wear and tear of the troughs was so great that they had to be abandoned.

In gravel deposits the gold is accompanied by a quantity of black magnetic iron sands. Pebbles of ironstone are also found, called by South American miners madre de oro, because their presence is said to indicate increased richness of the gravels.

The greatest difficulty in panning is to get rid of the black sand without loss of the smaller particles of gold; the last cleaning of the dust is generally carried out with a magnet, or the dry blowing-out of the last of this sand. In a sluice the separation of the black sand appears to be more easy than in the pan, owing to the boiling movement of the water in the riffles. The reason why rocks do not catch the gold as well as blocks is that they do not form a continuous bar across the sluices, and the gold in consequence escapes through the depressions between the points of the boulders.

It is noted that amalgamated gold is much less easy to retain or collect in a pan than gold dust, and this is possibly due to the tendency of dry amalgam to form into rounder grains. At many hydraulic mines people make wages by cleaning the bedrock and gullies formed in the tailings by floods; and it is notable that the gold so obtained is invariably a dry amalgam, and not free gold. Dry amalgam may be found in the sands of rivers miles below the outlet of a hydraulic mine. The gold must have been retained for some period in the riffles of the sluices to be so amalgamated, and then, in all probability, it escaped through the filling up of the riffles with black sand. Beyond this the author has been unable to find any evidence of the loss of gold in the extraction as practiced at hydraulic mines.

The proportion of gold recovered in the upper portion of a sluice to the total gold recovered will depend on and vary with the size of the grains of gold. At some California mines 80% of the total yield was recovered in the first 200 feet of blocked sluice. At the Colombian Hydraulic Co.'s mine the gold was in very small grains; hence it traveled a greater distance. The author has found that at most mines, with 500 feet of blocked sluice and two undercurrents, all the gold that it will pay to collect may be recovered. The undercurrents, with this length of sluice, give from 10% to 15% of the total.

At a run at Gardner's Point, Cal., of 100 days, with a clean-up of $64,000, the first 150 feet of sluice produced $54,000, or 85.72% of the total; then 640 feet of sluice produced $6000, or 9.53%; and, finally, three undercurrents produced $4000, or 4.75%.

At the North Bloomfield mine, Cal., 2,919,000 cubic yards of gravel gave the following results: From the sump, 0.80%; 1800 feet of sluice, 92%; the tunnel below the sluice, 3.75%; 300 feet of tail sluice, 0.95%; and the undercurrents, 2.50%.

Taking the above examples, and the run at the Colombian Hydraulic Co.'s mines, it will be noted that only a small percentage of the gross yield in gold reached the tail sluices, and from this it may be inferred that the loss of gold was small, unless the gravels contained a large portion of float gold—a point very difficult to determine, as pan tests have not led to its discovery in any quantity.

A test made by F. S. MacArthur upon a sample of auriferous gravel may, however, throw some light upon this subject. The sample, dissolved in water and agitated with quicksilver, yielded 90.963% of the total gold contents; it was then dried and treated with cyanide solution, yielding 0.593%; it was then ground and reamalgamated with quicksilver, yielding 7.413%; and, finally, it was dried and again treated with cyanide solution, yielding 1.031%. The residues were then assayed for gold, and were reported to have given a trace of gold. The total gold obtained by amalgamation was 98.376%, and by cyaniding 1.624%.

At Gardner's Point, Cal., 448,000 cubic yards of dirt were run off, yielding $140,000, and the tailings were caught and confined in a ravine below the claim. The length of sluice at the mine was 1378 feet, with three undercurrents; the ravine, supposed by many to be exceedingly rich, was cleaned up and the gross yield was $1168, or not 1% of the total receipts from the washings.

Probably no gravel deposit has had so much prospecting as the property of the North Bloomfield Gravel M. Co., California; $63,956.20 was expended in these operations. Four shafts were sunk. No. 1 shaft struck bedrock at a depth of 207 feet, and drifts were driven from the bottom of this shaft a distance of 1200 feet on the course of the channel, and the width was estimated at 500 feet. The aggregate length of the channel explorations was over 2000 feet. The samples of the various drifts indicated a value of $2.01 per cubic yard. The actual yield of 21,644 tons of gravel extracted from these drifts was about $2.75 per cubic yard, but it must be noted that this was bedrock gravel. The average yield per cubic yard of the entire gravel appears to have been as follows: 1894–95, 3.99 cents; 1895–96, 6.60 cents; 1896–97, 12.68 cents; 30,000,000 cubic yards of gravel washed gave an average yield of 8.7 cents per cubic yard.

TABLE I.—SECTION OF THE MALAKOFF SHAFT OF THE NORTH BLOOMFIELD GRAVEL M. CO., CAL.

Thickness of Gravel.....	Depth From Surface.....	Number of Colors of Gold per Pan of Dirt.....	Thickness of Gravel.....	Depth From Surface.....	Number of Colors of Gold Per Pan of Dirt.....	Thickness of Gravel.....	Depth From Surface.....	Number of Colors of Gold Per Pan of Dirt.....
Feet.	Feet.		Ft.	Feet.		Feet.	Feet.	
10	10	Nil.	5	184	3	1	210	15
65	75	1	3	187	8	1	211	62
10	85	20	3	190	6	1	212	60
25	110	10	1	191	10	1	213	44
22	132	1	1	192	8	1	214	40
2	134	15	1	193	9	1	215	18
2	136	8	1	194	5	1	216	20
4	140	10	1	195	2	1	217	12
2	142	20	1	196	30	1	218	15
2	144	40	1	197	20	1	219	8
2	146	23	1	198	47	1	220	Nil.
4	150	7	1	199	6	1	221	1
2	152	12	1	200	9	1	222	10
2	154	Nil.	1	201	5	1	223	44
2	156	3	1	202	2	1	224	34
2	158	8	1	203	15	1	225	48
2	160	23	1	204	73	1	226	25
2	162	7	1	205	20	1	227	15
2	164	15	1	206	63	1	228	6
5	169	5	1	207	71	8	236	*
5	174	3	1	208	44	Bedrock.		
5	179	8	1	209	62			

*5 to 20 cents per pan of dirt.

From Table I a rough indication of the varying richness of the gravels is obtained, and some idea may be formed of the difficulty of obtaining a correct estimate of the average richness of the deposit. It will be seen that the upper 195 feet of gravel contained little gold as compared with the last 12 feet. Consequently, the yield of the gravel from the drifts could not be considered a test of the value of the whole deposit, and, taking into consideration the circumstance of the very unequal distribution of the gold, together with the fact that for some considerable period the runs would have a much larger proportion of the top dirt to bedrock cleaned than a perpendicular section would give, the results do not appear to indicate a considerable loss of gold in the extraction.

Table II gives details of an auriferous gravel deposit in the United States of Colombia, S. A., in which the gold was also unequally distributed and over 33% of the ground was barren.

In pan tests of auriferous gravels no account is taken of large boulders and beds of unproductive

*Condensed from a paper read before the Inst. Min. Engineers.

sand, and these not infrequently form a large proportion of the deposit; hence a great reduction should be made upon a valuation based upon such tests. Even an estimate based upon the working of a portion of a gravel deposit by hand requires considerable reductions to be made, because in this case the overburden and poorer portion of the deposit is first stripped and got rid of by what are termed "booms" of water before any attempt is made to break into the auriferous portion of the gravel—this being the most economical way of getting rid of the worthless dirt, which, if broken with the gravel, would undoubtedly carry off a portion of the gold. Finally, the most reliable test of a gravel deposit appears to be the averaging of the results obtained by means of a number of boreholes.

TABLE II.—SECTION OF AN AURIFEROUS GRAVEL DEPOSIT IN THE UNITED STATES OF COLOMBIA, SOUTH AMERICA.

No.	Description of Strata.	Thickness of Strata. Ft.	In.	Depth From Surface. Ft.	In.
1.	Red earth. Without gold	34	0	34	0
2.	Fine red gravel. Poor	22	6	56	6
3.	Red sand; soft. No gold	5	6	62	0
4.	Coarse red gravel, with boulders 50 lbs. in weight. Rich streak near upper portion; rest is poor.	90	0	152	0
5.	Yellow sand. Hard. No gold	4	0	156	0
6.	Yellow and blue gravel. Coarse. Moderately rich	15	0	171	0
7.	Blue sandstone. Moderately soft. No gold	4	6	175	6
8.	Blue gravel. Moderately rich	22	0	197	6
9.	Blue sandstone. Hard	7	0	204	6
10.	Blue gravel. Hard. Moderately rich	11	0	215	6
11.	Lava bed, with angular grains of quartz	2	6	218	0
12.	Hard blue gravel. Richer than last	6	0	224	0
13.	Bed of fine, dark sand, with carbonized wood	7	0	231	0
14.	Lava	4	6	235	6
15.	Hard blue gravel; blasting ground. Rich	4	0	239	6
16.	Lava	5	0	244	6
17.	Hard blue gravel; blasting ground. Rich	5	0	249	6
18.	Lava	12	0	261	6
19.	Hard blue gravel; moderately coarse. Rich	9	0	270	6
20.	Lava	11	0	281	6
21.	Bedrock gravel; moderately coarse. Rich	7	6	289	0

NOTE.—The total depth comprises 97 feet of unproductive strata and 192 feet of productive gravel.

That results obtained at gold washings are sometimes less than reports upon the property would appear to indicate is true; the same may be said of vein mines, not necessarily on account of bad extraction, but probably on account of the manner of taking average samples of the material. The method of testing gravel deposits by boreholes should give much more reliable data than the old system of testing the outcrop and sinking a few shallow pits, as the outcrop of a gravel deposit is generally a concentration of the broken gravels, from which the less rich portion has been washed off in the course of ages, and the pits very rarely reach the bedrock before the amount of water encountered becomes too great to deal with.

Without doubt, hydraulic mining is the cheapest class of mining known, and, with abundance of water and gravel, large profits may be made from very poor ground. There are, however, other gravel deposits, rather more costly to work, but much more abundant in gold—namely, deep leads and shallow placers—which merit the attention of miners.

Fire Assay of Lead.

When the fire assay of lead is rendered unreliable by the buttons being alloyed with copper, the following method has met with success:

The lead ore or matte is treated with nitric acid, and the solution is diluted and filtered; precipitation is effected by sulphuric acid, throwing down $PbSO_4$, $BaSo_4$, $SrSo_4$, and $CaSo_4$. The precipitate is washed down to the point of the filter with water, to which a drop or two of sulphuric acid is added, and then dried. The dry precipitate is placed in a small annealing cup of clay and the filter is ignited; the ashes are added to the precipitate in the cup. Cyanide of potassium equal to about five times the weight of the precipitate is then added; a larger quantity will do no harm. The whole of the contents of the cup are fused at a gentle heat over a spirit lamp. The lead sulphate in a few minutes is reduced to metallic lead —C.P.—which settles in the bottom of the cup. The cup is allowed to cool, and then, with contents, is placed in a porcelain dish with water. The cyanides readily dissolve, leaving the metallic lead, which is dried and weighed.

NEGOTIATIONS are in progress to combine all the soft coal mines of Ohio, Pennsylvania, Indiana and Illinois into one corporation with a capital approximating $300,000,000.

Treatment of Highly Acidic Tailings by Cyanide.

By F. B. STEVENS.

The Rand batteries are almost all situated on a gentle southward slope, and the tailings have been accumulated in earthwork or sandbag dams. The tailings settled in one dam and overflowed into a second, where the last of the slimes settled, and the comparatively clean water was pumped back to the battery. The tailings, entering the dam in most cases at the shallow end, deposited the bulk of the heavy pyrites that had escaped the vanners and the coarsest of the sand at that end; toward the middle of the dam medium sands and finer pyrites, and at the end and deepest part the slimes and very fine sand and pyrites settled. The first tailings accumulated, being from the free milling ore, gave good extraction, with low consumption of cyanide, owing to their freedom from sulphates and sulphuric acid. In some cases, however, they had been dammed in watercourses where there had been a considerable growth of grass and rushes, and the decay of this vegetable matter generated such an amount of humic acids that all attempts to profitably treat such tailings ended in failure. The African Gold Recovery Co. acquired the rights over tailings deposited over 3 miles of the Natal creek, but the enormous consumption of cyanide and the low extraction, combined with bad precipitation, left little if any profit, although the tailings were fairly rich. In the treatment the ore was mixed with lime after a preliminary water washing, and washed with caustic soda solution till quite alkaline, but still the consumption of cyanide was high. The solution came through the boxes an earthy brown color, and quite thick, very often with organic compounds formed from the action of the vegetable acids on the cyanide. This brown matter coated the zinc to such an extent that precipitation almost ceased, and nothing but continual stirring would keep the zinc clean. The precipitate, when cleaned up from the zinc boxes, was very poor in gold, and was troublesome and expensive to smelt.

When I was appointed manager of a company that was working the tailings of the Wemmer Gold Mining Co., Johannesburg, the extractions were bad, the consumption of cyanide and caustic soda was high, and the precipitation of the gold bad. The solutions, after running through the boxes, assayed over an ounce of gold to the ton of solution, and the bottoms of all the solution sumps were caked to a depth of a foot with solid iron hydrate. The tailings were highly pyritic, and the pyrites oxidized in a remarkably short time, owing to the pyrites being largely marcasite. The tailings were heavily charged with ferrous and ferric sulphates and free sulphuric acid, and if put into a funnel and leached with water the solution came off deep red in color. This color had nothing to do with the action of potassium sulphocyanate on salts of higher iron. Shovels only lasted a fortnight on these tailings, becoming as thin as paper in that time. The works had always shown a large discrepancy between the extraction as shown by assays and the actual extraction, in spite of very careful sampling. The sampling was done by taking a sample from each truck going to the works and from each truck leaving the vats, by means of an ordinary hollow rod. Moisture assays were continually made to get the correct dry weight of the tailings. (Sampling a treated vat with a rod is a very bad method, as the ore is generally poorer on top than down below, and the rod filling at the top with poor sand goes down to the bottom filled, and the result is a lower assay and a higher extraction than is really the case.) It had been the practice to leach these tailings with water in the same vats that cyanide treatment was being carried on in. Mr. W. R. Feldtmann, who was a director of the company, suggested that gold was being lost during the water washing, owing to sufficient cyanide remaining in the wood and filter bottom to react with acid and generate cyanogen, which would rise through the ore, forming soda-cyanide with the caustic soda in the water washes. On assaying the tailings before and after washing, as high a loss as 1 dwt. of gold per ton was found. Mr. Feldtmann then suggested that water washing should be carried out in a separate vat, and the sands transferred to another vat for cyanide treatment. This course was adopted and the loss of gold ceased. The process as then carried out was as follows: After twelve hours' washing with water only the sands were transferred to another vat and mixed with lime and given a wash of caustic soda. All these washes were run to waste. To prevent iron hydrate from getting into the zinc boxes, it was found a good plan to fill the vat to a depth of 3 inches with sand, and then spread over it a layer of lime. In spite of all the water washing, there would be as much as 3 inches of iron hydrate over the layer of lime in some very acid vats, owing to the proportion of insoluble basic iron sulphate in the sand being high. After the washes began to come off distinctly alkaline the ordinary cyanide treatment was carried out.

Before the prolonged water washing treatment was carried out it was no uncommon thing, I believe, for the solution to come off sky blue, from the formation of prussian blue by the action of basic iron sulphate on cyanide of potassium. This acid solution was run through the zinc boxes just as it was causing a great consumption of zinc with very little precipitation of gold, and after that, probably, run into a sump containing cyanide solution, the result being wholesale decomposition of cyanide according to the following equation:

$$H_2SO_4 + 2KCy = K_2SO_4 + 2HCy.$$

So charged were the solutions with HCy that they were positively dangerous, and two cows that managed to get only one lick each at a vat tumbled over dead without a quiver. Once or twice afterwards, owing to insufficient washing, prussian blue came down, but we took care to run on caustic soda, which broke it up according to the equation:

$$3FeCy_2\ 12Fe_2Cy_6 + 12NaOH = 3Na_4FeCy_6 + 2Fe_2(OH)_6,$$

and any free acid was neutralized at the same time. The solution was then strengthened with fresh KCy and run through the zinc boxes.

We never succeeded in reaching a normal consumption of KCy, owing to the fact that the ferrous hydrate precipitated in the vat by the caustic soda acted on the cyanide to form caustic potash,

$$Fe(HO)_2 + 6KCy = 2KHO = K_4FeCy_2,$$

and this difficulty could not be got over. The ferric hydrate has no action on cyanide, and, fortunately, ferric sulphate is the principal sulphate formed when iron pyrites undergoes oxidization. Covering the bottom of the tailings vats with a layer of lime effectually stopped the iron hydrate from reaching the zinc boxes, and the solution came through quite clear. The slimes in many dams were far more acid than the tailings, not through their containing more pyrites, but owing to the fact that the rain water washed the iron salts out of the tailings, and they were absorbed by the slimes, which, after a stretch of dry weather, became ready to absorb more acid; and no matter how heavy the rain was, it never washed any acid out of the slimes. The lumps of slime that got into the vats along with the tailings invariably went out richer than they went in. The slime lumps went into the vat comparatively dry and absorbed gold-carrying cyanide solution, and no amount of washing would wash that solution out. Such lumps of slime when broken showed concentric rings of prussian blue, which, however, very seldom penetrated more than 1 inch. Some managers used to break up the slime into fine lumps and mix with clean tailings. This might answer where the slime was dry and consisted of very fine quartz sand, but with clayey slimes I doubt very much whether it is not a waste of time, owing to the absorption of solution by such material.

The Contact Vein.

The contact vein is one lying between two distinct kinds of rock—two dissimilar rocks—in which the dissimilarity has a genetic relation to the deposit. The contact lode may there be variously produced. It is found between sedimentary rocks; between sedimentary and igneous rocks; between two igneous rocks, or between a dike and the various sedimentary or igneous rocks it traverses. It may, therefore, at times be difficult to distinguish from an irregular deposit a bedded or even a fissure vein. For it may exist in irregular masses filling the spaces between the junction of two dissimilar rocks, or it may have been deposited parallel to the stratification between stratified rocks, or it may be scarcely distinguishable from a fissure vein, which by reason of a heavy throw has two walls of rock of different kind and age.

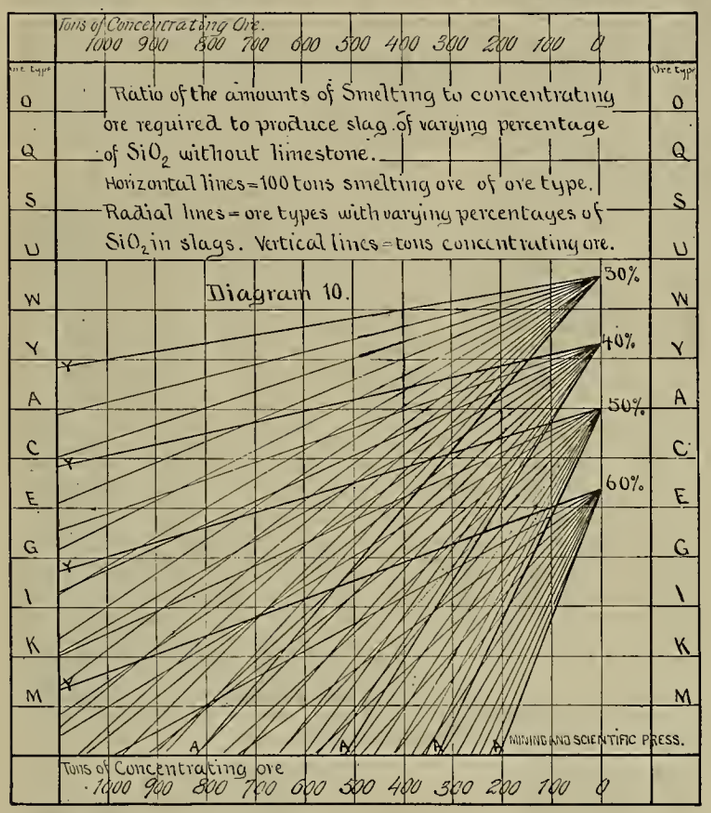
While subject to defects—common also to the fissure vein—the contact lode has certain favorable idiosyncrasies. Like the former, it follows the irregularities imparted to the rock faces in upheaval; it may also suffer from sliding and faulting; but, on the other hand, as it retains a constant relation to the enclosing rock, it is likely to be more uniform in structure and filling. Another peculiarity of the contact lode between sedimentary rocks or sedimentary and igneous rocks is its certainty to flatten out with depth. This follows from the fact that no stratified bed can continue to descend indefinitely. This feature, more pronounced as the inclination or dip of the contact more closely approaches the horizontal, is of importance in mining. It obviates the necessity of deep sinking, with its attendant costs and limitations, and it enables cheap and shallow shafts to exploit large lode areas. Far from being a class of deposit from which the mining investor should shrink, it is one that may, if the required conditions are found to be present, be exploited with as much confidence as the fissure vein. As instances of valuable lodes of this nature may be mentioned the deposits of red oxide of copper between limestone, granite and slate in Arizona; the copper pyrites between clay-slate and diorite at the Tanokuchi mines, Tosa, Japan; the sheets and strings of copper concentrated at the junction of trap and sandstone on the south shore of Lake Superior; the series of deposits at Leadville, Colorado; the auriferous deposits in Ouray county, Colorado; the Comstock lode, Nevada, and the copper pyrites at Sulitelma, Norway.

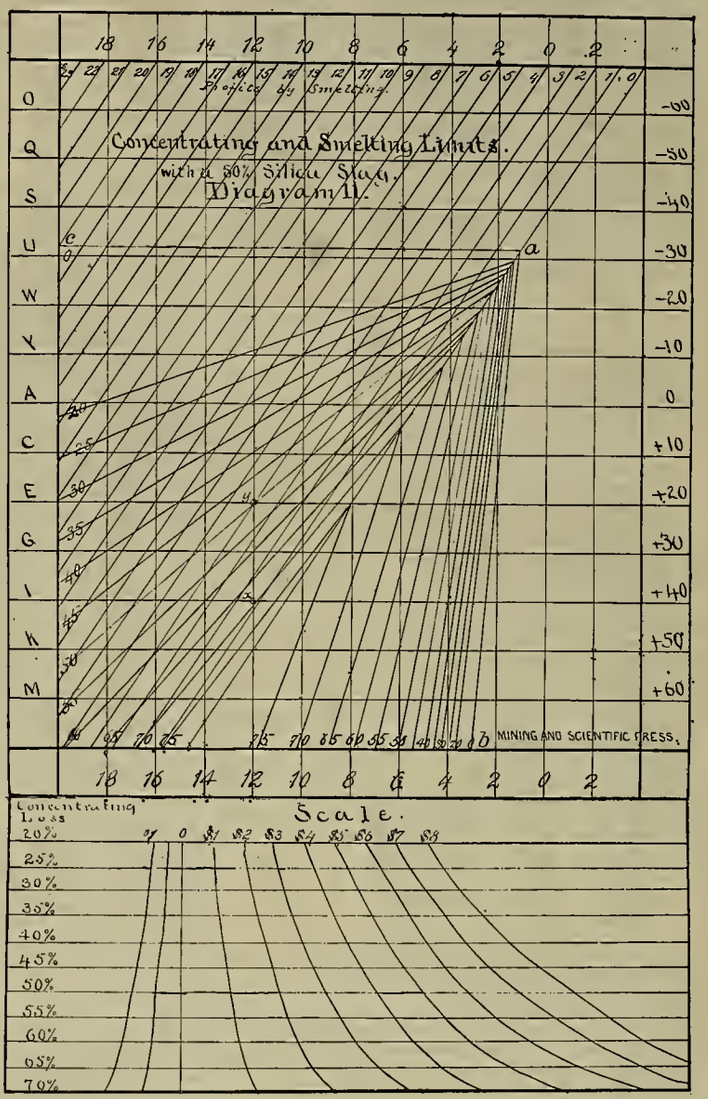
Costs and Profits in Pyritic Smelting of Low-Grade Copper Ores.

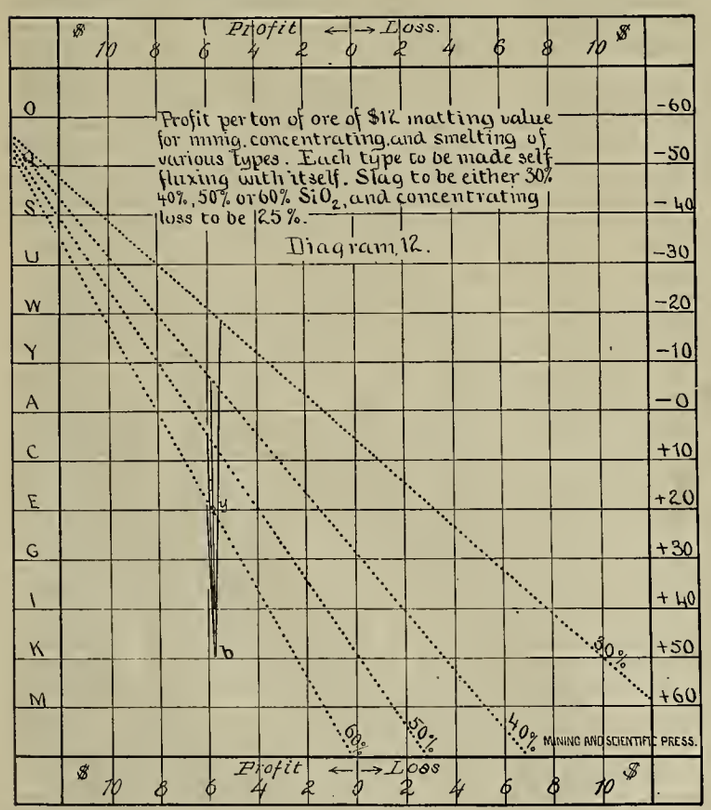
NUMBER V.

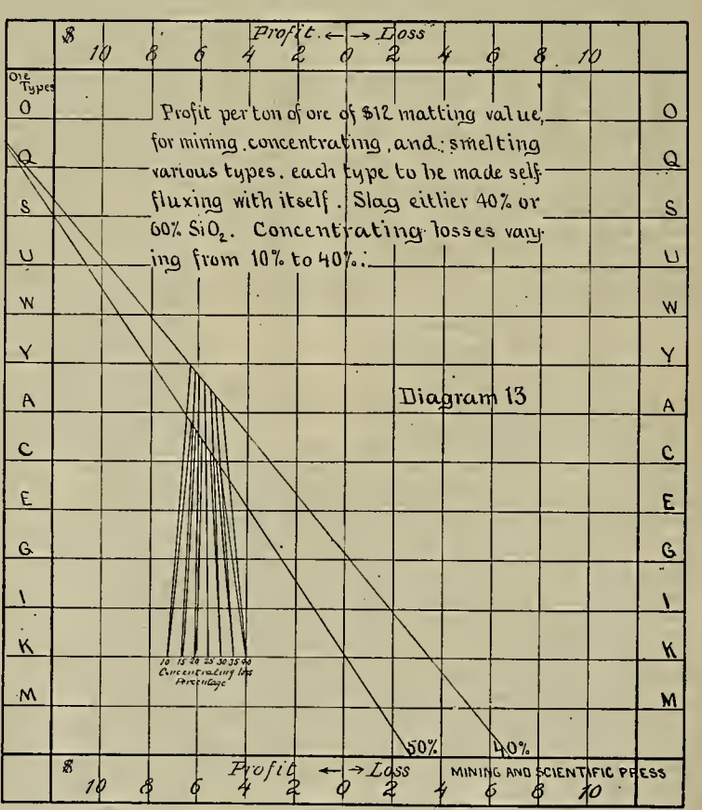
Written for the MINING AND SCIENTIFIC PRESS by F. H. PRENTISS, E. M.

Diagram No. 11 is designed to show the effect of varying losses of copper, gold and silver in concentrating when the high grade ore is fluxed by means of the concentrates, and the resulting slag carries 50% SiO_2. As in the first diagram, the line a d is the line of no profit when barren limestone is used as a flux. Were it possible to concentrate without any loss of gold, silver or copper, all of the ore falling below the line a c and to the left of the line a b would be more profitable to concentrate than to smelt direct, provided, of course, that the concentrates were utilized to replace the limestone. The diagonal line below a c and marked 20 at its termination, is the line for 20% loss in concentrating where it begins to be more profitable to concentrate and to sustain a loss of 20% rather than to smelt with limestone, and similarly for the lines below marked 25, 30, 35, etc. The line immediately to the left of a b, marked 20 at its terminal, is the division between concentrating and waste dump ore on a loss of 20%, and similarly for other percentages; the remaining lines to the left designate the type and value of ore where concentrating ceases to pay for the particular loss shown. It is clear that with a high coke cost there is a very large percentage of ore which it is more profitable to concentrate than to smelt, even though sustaining a heavy loss in the concentrating. Diagrams for a 40% SiO_2 and a 30% SiO_2 slag would show results still more favorable to concentration. The average ore of the mine examined was of type I and its matting value about $12 per ton. The intersection of the horizontal line for type I and the vertical line for matting value $12 (marked X) shows a profit on the diagram for smelting of $1.20 per ton—the lines parallel to a d showing profit by smelting. Measuring from point x horizontally to the right to line of 20% loss, and reading the length on the appended scale along the line of 20% loss, shows a concentrating profit of $7.20 per ton; and measuring


Tons of Concentrating Ore.
1000 900 800 700 600 500 400 300 200 100 0
Ratio of the amounts of Smelting to concentrating ore required to produce slag of varying percentage of SiO_2 without limestone.
Horizontal lines = 100 tons smelting ore of ore type.
Radial lines = ore types with varying percentages of SiO_2 in slags. Vertical lines = tons concentrating ore.
Diagram 10.
30%
40%
50%
60%
MINING AND SCIENTIFIC PRESS.
Tons of Concentrating ore
1000 900 800 700 600 500 400 300 200 100 0




Profit ←→ Loss.
Profit per ton of ore of $12 matting value for mining, concentrating, and smelting of various types. Each type to be made self fluxing with itself. Slag to be either 30% 40%, 50% or 60% SiO_2, and concentrating loss to be 25%.
Diagram 12.
30%
40%
50%
60%
MINING AND SCIENTIFIC PRESS.
Profit ←→ Loss


Profit ←→ Loss
Ore Types
Profit per ton of ore of $12 matting value, for mining, concentrating, and smelting various types, each type to be made self fluxing with itself. Slag either 40% or 60% SiO_2. Concentrating losses varying from 10% to 40%.
Diagram 13
50%
40%
MINING AND SCIENTIFIC PRESS
Profit ←→ Loss

similarly from x to the diagonal lines of other losses and applying to the scale, we find the corresponding profits.

Smelting with limestone.....$1.20
Concentrating with 20% loss and replacing limestone with concentrates..... 7.20
Concentrating with 30% loss and replacing limestone with concentrates..... 5.90
Concentrating with 40% loss and replacing limestone with concentrates..... 4.70
Concentrating with 50% loss and replacing limestone with concentrates..... 3.60
Concentrating with 60% loss and replacing limestone with concentrates..... 2.40

The necessity of concentrating part of the ore in order to flux the balance is clearly shown—even a high loss in concentrating is preferable to direct smelting with barren flux. In diagram No. 10 we have the means of determining at a glance the amount of ore of one type that must be concentrated to flux a given amount of another type to form slags of varying percentages of silica. Take, for example, 100 tons of type C and it will be seen that to flux it to a 40% SiO_2 slag will require 250 tons of ore of type G. Starting where the lines converge at 40%, follow the right-hand line (A) down to horizontal line C and read to the left A B C D E F G (point marked X) and at bottom of diagram result is shown. Let us make a 50% SiO_2 slag by fluxing ore of type E with itself. Point y shows that to every ton smelted there must be 1.35 ton concentrated. Suppose the ore to have $12 matting value and to sustain a loss of 25% in concentrating. On diagram No. 11 the ore is shown by point y and the smelting profit is given at $4 and the concentrating at $6.80. The profit therefore is ($4 + 1.35 × $6.80) ÷ 2 35 = $5 61 per ton. This is shown in diagram No. 12 at the intersection of the horizontal line of type E with the line (nearly vertical) connecting point h with the diagonal dotted line of 50% SiO_2 slag.

This diagram No. 12 is made in the manner just indicated and covers any type of ore of matting value of $12 which is made self-fluxing by the concentration of the right proportion to form slags of 30%, 40%, 50% and 60% SiO_2. The nearly vertical lines radiating from h terminate in the dotted lines where the ores become self-fluxing for that particular slag. It is to be noted that ore of type I, which is the average of the mine, only varies from a profit of $5.60 for a 30% slag to $5.85 for a 60% slag, showing how little is the effect upon the profit, of the silica percentage in the slag, provided barren limestone flux is omitted—in fact, the type of ore itself has but little to do with the profit question, as is readily seen by the diagram. The greatest variations (in the diagram) are from 24% SiO_2 to 67% SiO_2 in the ore, and from 30% SiO_2 to 60% SiO_2 in the slag, while the greatest variation in profit is from $5.40 to $6. This covers a matting value of $12 per ton and a concentrating loss of 25%. It is obvious that by sorting the ore less silica will go to the smelter, and that the concentrating loss will fall upon a lower grade of ore. In this manner an additional profit of from 25 cents to $1 (25 cents on a low concentrating loss and $1 on a high concentrating loss) per ton may be secured on all the ore mined, thus making a total of $6 profit under the poorest conditions.

However desirable it may be to concentrate a part of the ore, a loss in the mill is not to be neglected. Diagram 13 shows the effect of this loss per ton of ore mined. In this diagram, to avoid a multiplicity of lines, only two slags (40% and 50%) have been calculated, but the concentrator losses range from 10% up to 40%. Each type of ore is fluxed with itself, and therefore sorting would show better results. Take ore of the type I as before and the profit per ton of ore mined is $4.40 with a 40% mill loss and $7.20 with a 10% mill loss. Ores like type C (which shows a range from $4 90 to $6 70) having less silica are less affected by variations in concentrating loss, since a large proportion can go direct to the smelter. Where concentrating loss is high (40%) the less siliceous ores show better profit, while a low loss in concentrating (10%) shows a better profit for the ores high in silica, since it is the cheaper method of eliminating the silica, providing the loss in values is kept down. With a 20% loss the advantages are about balanced.

The average ore of this mine corresponds to type I with matting value of $12, and it is interesting to note how the profit and loss varies with the treatment.

Ore sorted, concentrating loss 10%, any slag—profit.$7.50
Ore not sorted, concentrating loss 10%, any slag—profit..... 7.20
Ore not sorted, concentrating loss 15%, any slag—profit..... 6.70
Ore not sorted, concentrating loss 20%, any slag—profit..... 6.20
Ore not sorted, concentrating loss 25%, any slag—profit..... 5.70
Ore not sorted, concentrating loss 30%, any slag—profit..... 5.20
Ore not sorted, concentrating loss 35%, any slag—profit..... 4.80
Ore not sorted, concentrating loss 40%, any slag—profit..... 4 35
Ore smelted direct with limestone, 60% SiO_2 slag—profit..... 3.50
Ore smelted direct with limestone, 55% SiO_2 slag—profit..... 2.40
Ore smelted direct with limestone, 50% SiO_2 slag—profit..... 1,20
Ore smelted direct with limestone, 45% SiO_2 slag—loss..... .30
Ore smelted direct with limestone, 40% SiO_2 slag—loss..... 1.90
Ore smelted direct with limestone, 35% SiO_2 slag—loss..... 4.30
Ore smelted direct with limestone, 30% SiO_2 slag—loss..... 7.80
Ore smelted direct with limestone (cold blast) 30% SiO_2 slag—loss..... 9.00

By sorting the ore, using hot blast for smelting and with fair efficiency in concentrating, it is obvious that a $12 ore (matting value) will readily yield a profit of $6 per ton.

In one part of the mine there are evidences of heavy sulphide ore (type U), though much less abundant than the remaining ore (type I), yet to the extent it exists the former may be used as a flux for the latter. Diagram 6 shows that to make a 50% SiO_2 slag type U has a deficit of 30% of silica, and since type I has an excess of 40% of SiO_2 (Col. 6) it will require four tons of the former to flux three tons of the latter. Diagram 8 shows cost of mining and smelting (hot blast and 50% SiO_2 slag) type U to be $1.30 and type I $10 80, making total cost $1.30 × 4 + $10.80 × 3 = $37.60, or $5.37 per ton. With a matting value of $12 the profit per ton is $6.63. For other percentages of SiO_2 in the slag the result would be the same.

(TO BE CONTINUED.)

Compressed Air for Pumping Plants.

For convenience in figuring on large pumping plants to be operated by compressed air, there is given herewith a table by which the pressure and volume of air required for any size pump can be readily ascertained. Reasonable allowances have been made for loss due to clearances in pump and friction in pipe.

To find the amount of air and pressure required to pump a given quantity of water a given height, find the ratio of diameters between water and air cylinders and multiply the number of gallons of water by the figure found in the column for the required lift. The result is the number of cubic feet of free air. The pressure required on the pump will be found directly above in the same column.

For example: The ratio between cylinders being 2 to 1. Required to pump 100 gallons, height of lift 250 feet. We find under 250 feet at ratio 2 to 1 the figures 2.11; 2.11 x 100 = 211 cubic feet of free air. The pressure required is 34.38 pounds.

Ratio of Diameters.	PERPENDICULAR HEIGHT, IN FEET, TO WHICH THE WATER IS TO BE PUMPED.																				
	25	50	75	100	125	150	175	200	225	250	300	350	400	450	500						
1 to 1	13.75	27.5	41.25	55.0	68.25	82.5	96.25	110.0	.....	.....	.....	.....	.....	.....	.....	Air pressure at pump.					
	0.21	0.45	0.60	0.75	0.89	1.04	1.20	1.34	.....	.....	.....	.....	.....	.....	.....	Cubic feet of free air per gal. of water.					
1¼ to 1	.....	12.22	18.33	24.44	30.33	36.66	42.76	48.88	55.0	61.11	73.32	85.4	97.66	.....	.....	Air pressure at pump.					
	.....	0.65	0.80	0.95	1.09	1.24	1.39	1.53	1.68	1.83	2.12	4.41	2.70	.....	.....	Cubic feet of free air per gal. of water.					
1¼ to 1	.....	.....	13.75	19.8	22.8	27.5	32.1	36.66	41.25	45.83	55.0	64.16	73.33	82.5	.....	Air pressure at pump.					
	.....	.....	0.94	1.14	1.24	1.30	1.54	1.69	1.84	1.99	2.39	2.59	2.83	3.19	.....	Cubic feet of free air per gal. of water.					
2 to 1	.....	.....	.....	13.75	17.19	20.63	24.06	27.5	30.94	34.38	41.25	48.13	55.0	61.88	68.75	Air pressure at pump.					
	.....	.....	.....	1.23	1.37	1.52	1.66	1.81	1.96	2.11	2.40	2.69	2.98	3.28	3.57	Cubic feet of free air per gal. of water.					
2¼ to 1	.....	.....	.....	.....	13.75	16.5	19.25	22.0	24.75	27.5	33.0	38.5	44.0	49.5	55.0	Air pressure at pump.					
	.....	.....	.....	.....	1.533	1.68	1.83	1.97	2.12	2.26	2.56	2.85	3.15	3.44	3.73	Cubic feet of free air per gal. of water.					
2½ to 1	.....	.....	.....	.....	.....	13.2	15.4	17.6	19.8	22.0	26.4	30.8	35.2	39.6	44.0	Air pressure at pump.					
	.....	.....	.....	.....	.....	1.79	1.96	2.06	2.104	2.34	2.62	2.88	3.18	3.36	3.23	Cubic feet of free air per gal. of water.					

—Compressed Air.

Zinc as a Preventive of Boiler Corrosion.

Zinc is often used in boilers and hot water tanks to prevent the corrosive action of the water on the metal of which the tank or boiler is composed. The action appears to be an electrical one, the iron being one pole of the battery and the zinc being the other. Under the action of the current of electricity so produced, the water in the tank is slowly decomposed into its elements, oxygen and hydrogen. The hydrogen is deposited on the iron shell, where it remains. It will not unite with iron to form a new compound, but if any iron rust is present it will remove the oxygen from this and deposit the metallic iron on the plates. The oxygen of the water that is decomposed, instead of going to the iron, goes to the zinc, and forms oxide of zinc, and in the course of time the zinc will be found to be almost entirely converted into oxide. On account of the action outlined, it is generally believed that zinc is always a good thing to prevent corrosion, and that it cannot be harmful to the boiler or tank under any circumstances. Some experiences go to disprove this belief, and there are cases in which zinc has not only been of no use, but has even been harmful. In one peculiarly marked case a 100 H. P. horizontal tubular boiler had been troubled with a deposit of scale consisting chiefly of organic matter and lime, and zinc was recommended as a preventive. When an inspection was made, large amounts of detached scale from the shell and tubes were found in the bottom of the boiler, and the iron surfaces from which they had been detached showed markedly the action of the zinc, the crystals of which, deposited upon the iron, gave it the appearance of frosted silver work. On the rear portions of the tubes, the scale being much heavier and more obstinate, they partially remained; but it was easily loosened and detached, and when it was removed the same frosted appearance of the iron was observed. The beneficial action of the zinc was so obvious that its continued use was advised, with frequent opening of the boiler and cleaning out of detached scale until all the old scale should be removed and the boiler become clean. Eight or ten months later the water supply was changed, it being now obtained from another stream, supposed to be free from lime, and to contain only organic matter. This change of feed water was unknown to the inspector, who two or three months after its introduction opened the boiler for inspection and was greatly surprised at its condition. The tubes and shells were coated with an obstinate, adhesive scale, clinging tenaciously to the iron, and composed of zinc oxide and the organic matter or sediment of the water used. The deposit had become so heavy in places as to cause overheating and bulging of the plates over the fire. It was with difficulty that these patches were separated and removed by the use of long chisels made specially for the purpose. This action of zinc when the water supply is changed has been noted in many cases, but in no other case has the contrast between its beneficial action at first and its injurious action afterward, in the same boiler, been so marked. From these experiences it is manifest that in making use of zinc the boiler should be frequently opened and the action carefully watched, so that if any undesirable effects show themselves they may be checked in time to prevent serious trouble.

Market Value of Ores.

The question of disposing of ores for their market value is one that confronts miners in any region. Metal-bearing ores have a market value the same as wheat, corn or oats; but the method for determining the value of the product of a mine is necessarily not as simple a process as determining the value of a horse or a pound of wool.

The prospector or miner may be a suspicious individual—always on the lookout for fear some one will get the best of him—but would not be suspicious naturally unless he had some fancied cause to be so. Miners sometimes say that it is no use to develop their property, because there is no fair market for their product. "Suppose," they say, "our ore has an assay value of $50 per ton, gold and silver, with 20% lead besides, and we have had many assays from our ore showing that value, do you suppose we can get anywhere near that figure when we come to sell it? Not a bit of it! We are playing in great luck if we realize $3 or $4 per ton out of it."

Ores are shipped direct from a mine to a smelter or a custom sampling establishment, whose business it is to sample the shipment and to furnish a sample to the owner of the ore, and, in the case of a public sampling works, also to those who may wish to purchase. An assay of that sample determines the value. If a sample carefully taken from a carload of ore before it leaves the mine will repeatedly return an assay value of $50 silver and gold and 20% lead, it should come very close to that figure after being honestly sampled and offered for sale. The product of a mine from which it is impossible to obtain a lower assay from samples along the vein or from each sack of ore shipped, than $50 per ton gold and silver, and 20% lead, ought to pay its owners handsomely, and it should also pay the smelter a fair profit.

The Late Mr. John Taylor.

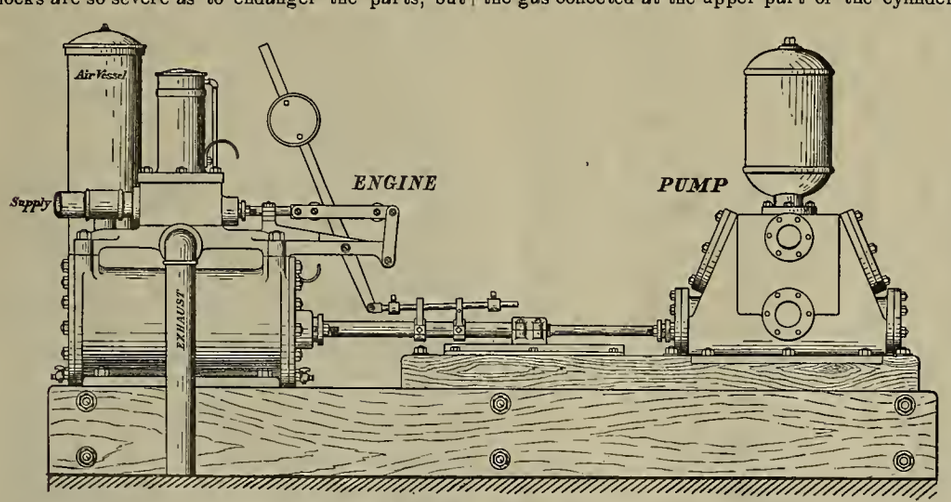
Herewith is a good portrait of John Taylor, one of the pioneers of California and a prominent mining man, who died in San Francisco on the morning of June 2. Mr. Taylor came to California in 1849, brought thither by the report of the discovery of gold. He was born in Westport, Conn., Aug. 13, 1826. When twenty-one years old he engaged in manufacturing in New York City, but at the news of the discovery of gold in California he joined the throng which left New York for the Pacific coast, taking passage around the Horn on the ship Orpheus. Shortly after his arrival he left for the mines on the American river, joining his brother Chauncey, who had preceded him. Mr. Taylor's mercantile tendencies soon induced him to return to a commercial life, and accordingly he engaged in general merchandising in Sacramento. In 1852 he moved to San Francisco and founded the firm of John Taylor & Co.

Mr. Taylor was a member of the California Society of Pioneers and a member of the Pacific Union Club.

The funeral services, held in the First Congregational Church of San Francisco, June 4, were conducted by the pastor, Rev. George C. Adams, who paid tribute to the character of the deceased. Rev. Samuel H. Willey, a friend from the early '50s, gave some reminiscences of those trying days. A quartette of male voices rendered several selections, and the flower-laden casket was borne to its resting place in Mt. View Cemetery by the employes of the mercantile house, some of whom had been in its service for two generations, the honorary pallbearers being Messrs. John F. Merrill, D. E. Hayes, William R. Sherwood, Edson Adams, E. C. Hutchinson, Geo. B. Crooks, Henry Palmer and G. Phillips, the two latter representing the Society of California Pioneers.

Hydraulic Pumping Engine.

In cases where a supply of water is to be raised by water pressure and the head is too great for hydraulic rams, water power engines are a suitable means for such duty. A hydraulic ram will operate well with driving heads up to 40 feet or so; but beyond this the pulsations become slow and the shocks are so severe as to endanger the parts; but



Hydraulic Pumping Engine.

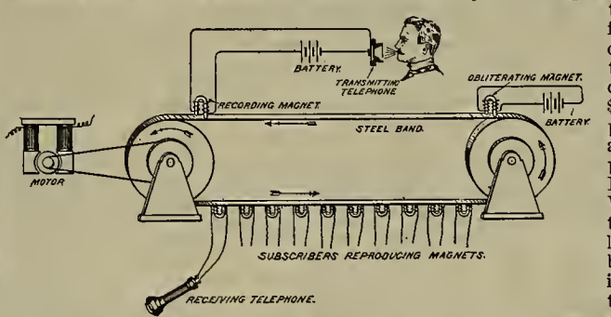
an engine may operate at any head or pressure without any loss of effect, except such as is normally due to the friction of the water and the pistons.

An engine to operate by water power requires a good many points of difference from steam engines. The distributing valves must be balanced and must be moved independent of the piston, or after the piston stops, or to be more exact, must move in advance of the piston's stroke. This is accomplished in various ways, by water pressure, springs, or by a descending weight, the last being the most simple and the device adopted in the drawing above. The weight on the lever is raised to a vertical position each way by the tappets on the piston rod and then falls by gravity through an arc of about 30°, striking the valve gearing near the end of its descent, moving the valve right and left. To enable this to be done with but little force the valve, a plain slide, is balanced by a piston seen on top of the valve box.

The machine shown is arranged as four to one—that is to raise water 400 feet with a head of 100 feet, or in that proportion. There is no limit of pressure or heads, except that the castings or other parts have to be made stronger as the head is increased. The frame, here shown of wood, can be made of cast or wrought iron, or the pump and engine can be connected by strut rods and a frame dispensed with. The drawing was furnished by the Water Supply Association, of 22 California street, San Francisco, Cal.

A Talking Newspaper.

It is now proposed to utilize the telephonograph as a talking newspaper. In the figure is shown a method which it is projected to employ. As the steel ribbon, which in this particular form is endless, and which is receiving the record, passes from one reel to the other, as indicated by the arrows, it passes consecutively before each of the receiving magnets, which are shown in horseshoe form, but which may



also be single pole, and the subscribers, whose telephones are attached to these magnets, are thus constantly being supplied with the latest news of the day, stock quotations, etc. After the ribbon or band has passed before these magnets, the obliterating magnet wipes out all of the magnetic lines of force stored up in the steel band, and it then passes on to receive fresh impressions from the recording magnet and telephone. In Budapest a talking newspaper system is run in connection with the supplying of music, and talking from the theatres by means of the "theatrophone." During the day the subscribers were constantly being informed of the latest news of importance. This service, which supplies many thousands of subscribers, is independent of the regular telephone service.

EXPERIMENTS to determine the liability of liquid and compressed acetylene to explode have been made at Berlin. Cylinders loaded with liquid acetylene were placed in position, a valve being at the top, and the gas collected at the upper part of the cylinders being under a pressure of 725 pounds per square inch. A cartridge of picric acid was applied and exploded by electricity, with the result of blowing off the top of the cylinder. The acetylene was not detonated, the cylinder emptying itself on the gaseous acetylene. A second cylinder was charged with the liquid, a cartridge placed in the bottom. An electric current was passed through this, the liquid acetylene exploding, destroying the cylinder. A third cylinder was fired at with a rifle without resulting explosion, nor was a further cylinder of acetylene disturbed by the explosion of a quantity of picric acid quite near. The conclusion arrived at was acetylene is undisturbed by sympathetic discharges, but that detonator being in contact therewith the liquid will invariably explode.

When Duty Is Not Paid.

Following is the form of oath required respecting mining machinery upon a free entry in Canada:

I, ..., the undersigned, importer of the mining machinery mentioned in this entry, do solemnly swear that it is mining machinery within the true meaning of the word and that at the time of its importation was of a class and kind not manufactured in Canada, and that it is imported for use in ..... mining only, at the ..... mine, situated ....., in the Province of ....., and will be used for no other purpose whatever.

Upon such machinery only as is covered by the above form can a Canadian miner secure exemption.

Bismuth.

The production of bismuth ore in the United States in 1901, says Dr. Struthers, amounted to 319 short tons, as compared with 220 short tons in 1900. Colorado supplied the entire output, Lake county contributing 254 tons and Ouray county 65 tons. All of the ore contained gold and silver values, for which producers were paid. The price of the bismuth contained varied from $8 to $11 per unit. As nearly as can be ascertained, the value of the 319 tons was $25,488, less the deductions of transportation and treatment charges, or an average of $80 per ton. The ore was purchased by the Leadville Sampler, at Leadville, the State Ore Sampling Works, at Denver, or was shipped direct to Johnson, Matthey & Co., Ltd., England. The world's supply of metallic bismuth is controlled by the combined interests of Johnson, Matthey & Co. and the Saxon government, who regulate absolutely the production and the prices of the metal and its ores. The importation of bismuth into the United States in 1901 was 165,182 pounds, valued at $239.061, against 180,433 pounds, valued at $246,597, in 1900. In addition to this, there was a small importation of bismuth in medicinal preparations. The occurrence of bismuth is widespread; it is found both in the combined and in the free state in many of the mining States.

Thunder Mountain District.

TO THE EDITOR:—There is an inclination to doubt the riches of the Thunder Mountain region. I will say, as I am in a position to know, that there is high-grade ore in Thunder Mountain district, and some very low. The average is higher grade than any camp I ever assayed from, considering it is nearly all surface rock. The prospectors do not yet understand the rock. Some of them have everything assayed, and we find gold as high as from $13 to $20 a ton in light, white porphyry. A few months more will tell more, but it is my opinion that the Thunder Mountain district will prove to be a rich and extensive gold mining country. T. H. MANNING.

Boise, Idaho, June 8.

FOR volumetric determination of copper, F. Repiton (Monit. Scient., 1902, 16,287) recommends the use of potassium ferro cyanide, instead of potassium cyanide. A N-10 solution is added from a burette to a boiling neutral solution of the copper as sulphate, until test drops on a porcelain plate show a blue coloration with ferrous sulphate. The application of this method to other metals is being investigated. Exact results are also obtained if a neutral solution of the copper as sulphate, chloride or acetate is precipitated with an excess of standard oxalic acid solution. Set aside for three hours, then add a little sulphuric acid and titrate excess of oxalic acid with permanganate solution of known relative value, the amount of oxalic acid combined with the copper being calculated by difference. The value of this, in terms of copper, is decided by repeating the process on a copper solution of known strength.

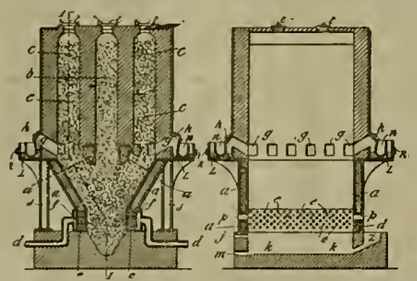
THE Pacific Oil Co., constructing for the Standard, will build ten brick pumping stations along the route of its 280-mile pipe line from Bakersfield to Pt. Richmond, Cal. Fifteen miles of 8-inch pipe have been laid at the Bakersfield end. There will be 600 carloads of pipe in the system. The oil will be pumped under a pressure of 600 pounds to the square inch. The company has a tankage capacity of 350,000 barrels at Pt. Richmond. In Bakersfield the present capacity is 2,000,000 barrels; five more tanks now being constructed will increase the tankage capacity to 2,405,000 barrels; the cost of the entire storage and pipe line system is figured to be $5,000,000. Supt. F. M. Towle says that if the materials were not delayed, the pipe line would be in operation by Jan. 1, 1903.

Mining and Metallurgical Patents.

Patents Issued June 3, 1902.

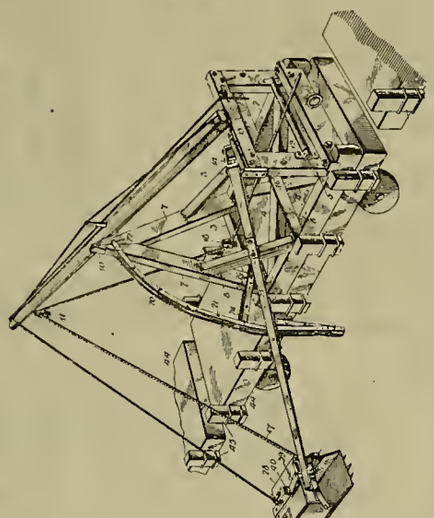
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR OBTAINING ZINC OR OTHER VOLATILE METALS FROM ORES OR MATTES.—No. 701,457; J. Armstrong, London, England.



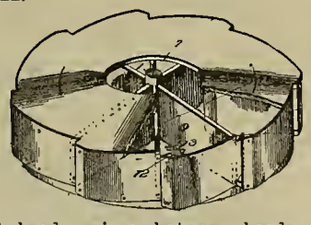
In furnace for reducing volatile metals, combination of central column for charge of mixed ore and fuel, side columns for fuel, reduction chamber below into which they all converge, large number of twyers or blast-orifices around reduction chamber whereby blast is broken into minute streams, quickly dioxidized, condensing device and exit passages for effluent gases direct to condenser close adjoining, whereby blast attacks evenly layer of fuel below part intermediate between charge and condenser, raises fuel above to high heat, effluent gases pass through this incandescent fuel above hottest heating zone on their way to condensers, carbonic dioxide is changed to carbon monoxide before it is cooled.

EXCAVATING AND LOADING MACHINE.—No. 701,593; D. H. Mahoney, Vincennes, Ind.



The combination of support, boom swiveled thereto, means for raising and lowering boom, guide for boom, scoop pivoted at open end to boom, adjustable arm on boom engaging adjustable stop on scoop to prevent tilting of latter during excavating, cord attached to closed end of scoop, adapted to right latter at end of its downward movement.

WATER WHEEL.—No. 701,355; J. M. King, Rochester, Minn.



Spaced heads, wings between heads joined at edges thereto, peripheral plates joined at the edges to heads having proximal ends passing by each other spaced apart, inner end of each plate attached to wing short distance from extremity, having projecting portion bent inward, outer end of each plate bent inward, overlapped end portions of adjacent plates outwardly converged.

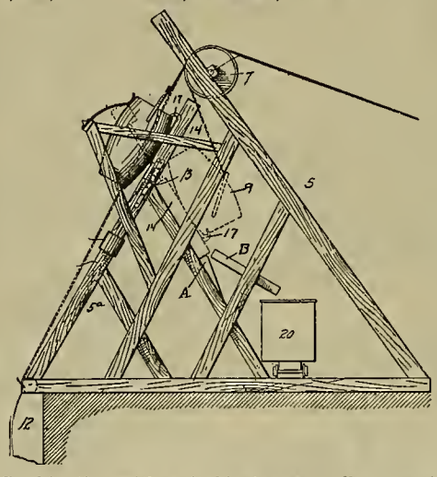
PROCESS OF HARDENING COPPER.—No. 701,429; S. L. Walter and F. W. Keiner, Ekastown, Pa.

Placing aluminum and charcoal in crucible, supplying crucible superposed mass of copper, then applying heat to cause combustion of charcoal and generation of carbonic-acid gas which passes upward through copper, carrying off any contained moisture in metals, time preventing oxidation thereof, whereby upon fusion of metals, copper, owing to its superior specific gravity, will intimately combine with aluminum presenting thereby hardened copper alloy.

DRILL.—No. 701,792; E. E. Atkinson, Ada, Ohio.

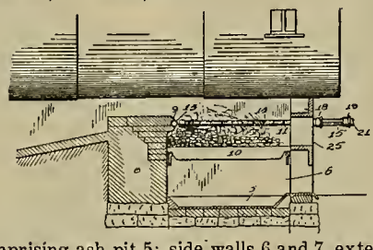
Stem and bit having interlocked portions provided with transversely disposed aligned openings, key located within openings, block having journal bearing, wedge movable upon block, actuating device journaled in bearing of block held against longitudinal movement therein, having an engagement with wedge to move it toward journal upon rotation of actuating device.

AUTOMATIC BUCKET DUMPING APPARATUS.—No. 701,812; T. N. Jones, Crisman, Colo.



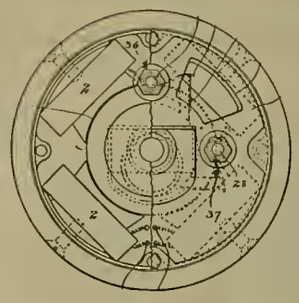
Combination with suitable frame, pulley mounted on upper part of frame, arranged to be engaged by bucket cable, inclined track mounted on frame, hinged dumping device normally forming continuation of bucket guide track, spring-held bucket-retaining device mounted on dumping device, arrangement being such that as bucket is drawn up inclined track, and landed on dumping device and cable slackened, gravity of bucket tips dumping device and throws bucket to inverted position.

SMOKE CONSUMER.—No. 701,296; D. Clump and W. Hofmeister, St. Louis, Mo.



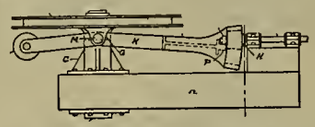
Comprising ash pit 5; side walls 6 and 7 extending upwardly from ash pit; bridge wall 8 extending upwardly behind ash pit, having forwardly projecting portion 9 at upper end; grate mounted above ash pit; perforated injector pipes 11 and 12 mounted in side walls suitable distance above grate; perforated injector pipe 13 mounted in forwardly extending projection 9 of bridge wall; steam air injectors 15, 16 and 17 connected to injector pipes 11, 12 and 13, being independently rotatable in their bearings, each comprising nipple 20 connected to steam pipes, having reduced discharge opening 22, nipple 23 formed integrally with nipple 20 in alinement therewith, nipple 24 formed integrally with nipples 20 and 23, nipple 24 extending backwardly and outwardly at angle of 45°.

ELECTRIC MOTOR.—No. 701,341; A. B. Holson, Chicago, Ill.



Combination of relatively stationary frame, main drive shaft journaled in frame provided with pair of driving pinions, armature mounted upon drive shaft between pinions, series of field pieces upon frame in co-operative relation to armature, driven member comprising duplex parallel annular racks encircling armature exteriorly of stationary frame, having its racks operatively engaged with respective pinions of drive shaft in diametrically opposite relation whereby driving moment of armature is imparted to driven member through both pinions simultaneously and in same direction.

PUMPING POWER FOR OIL WELLS.—No. 701,497; G. D. Newton, Cleveland, Ohio.



Suitable base, vertical pull wheel shaft, horizontal shaft mounted thereon, pull wheel journaled on former shaft, provided with lugs on lower side as shown, bevel pinion on latter shaft, endless internal bevel rack driven by pinion, arms attached to rack, hinged near center to above mentioned lugs on pull wheel, counterweight in outer ends of arms, small wheel on end of horizontal shaft to travel on an oblong ledge centrally located on rack.

PROCESS OF MAKING CYANIDES.—No. 701,604; G. Ottermann, Vienna, Austria.

Process of producing cyanogen compounds from waste household substances and similar organic substances containing nitrogen, consists in first subjecting substances to destructive distillation, then bringing resulting gases into contact with heated neutral material, then bringing gas into contact with heated carbonaceous material, finally bringing gases into contact with heated nitrogen-absorbing material.

TREATMENT OF COMPLEX AND REFRACTORY ORES.—No. 700,311; F. Ellershausen, London.

Process of treating complex and refractory ores containing lead, silver and zinc, smelting raw ores, churning fumes and gases with water to condense and mix them with water, settling out lead, silver and part of zinc compounds from resulting liquor as sludge, separating and drying sludge, fusing dried sludge with caustic alkali, thereby precipitating lead in metallic form, treating molten residue after separation of lead, to recover caustic soda and zinc sulphide, treating liquor from which sludge was separated with caustic soda to deposit zinc.

Treatment of Burns.

In treating burns of a serious nature, the first thing to be done after the fire is extinguished is to remove the clothing. The greatest care must be exercised, as anything like pulling will bring the skin away, too; so, if the clothing is not thoroughly wet, be sure to saturate it before attempting to remove it. If portions of clothing will not drop off, allow them to remain. Then make a thick solution of common baking soda and water, dip soft cloths in it and lay them over the injured parts; bandage them lightly to keep them in position. Have the solution by you, and the instant any part of the cloth shows signs of dryness squeeze some of the solution on that part. Do not remove the cloth, as a total exclusion of the air is necessary, and little, if any, pain will be felt as long as the cloths are kept saturated. This may be kept up for several days, after which soft cloths dipped in oil may be applied and covered with cotton batting. If the feet are cold, apply heat and give hot water to drink, and, if the burns are very serious, send for a doctor as soon as possible. The presence of pain is a good sign, showing that vitality is present.

MCKINLEY COUNTY has the only live volcano in New Mexico. It is 18 miles northeast of Gallup. Smoke arises all the time and the ground is very hot in the vicinity.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

The Treadwell mine during the year 1901 handled 457,802 tons of ore, an average yield of 1254 tons every twenty-four hours. The average yield of ore was $1.88 per ton, making a total for the year's production of $860,737. Working expenses, etc., amounted to $545.968, leaving a net profit of $352 559, or about $1.10 per ton. Since operations began 3,802,133 tons have been treated, yielding $18 531,627. The ledge is 500 feet wide; there are 880 stamps at work.

E. T. Leland reports results of deep diggings on Anvil creek at Specimen gulch, his foreman on Shaw gulch at Glacier creek, mentioning a visit to Specimen over the divide, to the Backus properties, which are No. 1 on Specimen and Anvil benches, adjoining same. When last season closed, arrangements were made for drifting during the winter. This has been prosecuted successfully and a large amount of dirt is ready for the spring washing. Eight miners' cars had been washed, which yielded $600—$75 to the car. These cars are three-fourths cubic yard capacity. He also states that the overhanging dirt in the drift ran 15 cents to the pan.

The Juneau Dispatch says the Sheep Creek mine is sold to O. Meyer of New York for $350,000. F. C. Hammond is Supt.

ARIZONA.

COCHISE COUNTY.

The new town of Douglas is a busy part of Cochise county. The entire plant of the Exposed Reef M. Co. has been totally destroyed by fire. Besides other buildings and machinery, the plant included a 10-stamp mill. The company was preparing to increase to forty stamps.

COCONINO COUNTY.

At the Coconino M. Co., at Ryan, the copper leaching plant is to be enlarged to 250 tons daily. A pipe line 14 miles in length will transmit the waters of Big Springs to the plant and properties below.

For $300,000 A. Nebeker has sold a quarter interest in the properties of the Coconino M. Co. to Miles Finlen.

GRAHAM COUNTY.

A contract has been let on the Summit group, near Metcalf, for driving an 80-foot tunnel for $2.50 per foot, which is cheap mining. Summit mines have produced ore averaging 40% at the smelters.

MARICOPA COUNTY.

At Wickenberg a new double compartment shaft being sunk at the O'Brien mine is down over 100 feet and is timbered with Oregon pine.

The Garcia mine has resumed. It is 8 miles from Wickenburg. The company has a pumping plant on the river that supplies water for camp use, 20-stamp mill and concentrators.

Near Wickenburg the Oro Grande, since its discovery last year, has 2000 feet of work, mostly in a 300-foot shaft, drifts and crosscuts. The ore is free-milling and assays run from $8 to $50 per ton; forty men are employed. Engineers are now on plans for a 400-ton plant. The mine is under the management of G. B Upton.

The miners in the O'Brien mine, near Wickenburg, are on a strike for $3.50 a day. They were receiving $3.

MOHAVE COUNTY.

Near Kingman the C. O. D. mine has been worked for silver alone. In the drift on the 300-foot level, 410 feet from the main shaft, an ore body carrying two ounces in gold has been found. In the east drift from the same level a body of ruby and native silver ore has been broken into. The mill is turning out four tons of concentrates every twelve hours. The mine shows the longest unbroken ore shoot opened up in Mohave county. The ore is of a milling grade.

At Gold Basin Supt. Aubrey has eleven men handling ore for his cyaniding tanks from the Cyclopics mine.

F. Dewey has a streak of ore in the Prince Albert mine at White Hills assaying 8000 ounces silver per ton.

The O. K. mill, in Gold Basin, operated by the Minnesota & Arizona Co., is working on ore from the El Dorado mine.

Six hundred tons ore from the Katherine mine, New Comstock group, gave $3826—$6 per ton. The ore was crushed to pass a 40-mesh screen; the saving on the plates and battery was $2 50 per ton. After this a 20 mesh screen was used and the battery amalgamation abandoned. The saving on the plates was equally as good as with the finer screens and the crushing capacity was raised from 1½ to 2 tons in twelve hours. The tailings were run to the cyanide tanks, after remaining twenty-four hours in the pits; the saving there was 85%, with a twenty-four-hour percolation. The cost of mining and milling the ore was as follows: Mining, per ton, 60 cents; hauling, 50 cents; milling, 60 cents; wood, 65 cents; cyaniding, 90 cents; total, $3 25.

Near Kingman, J. W. Gerritt has bonded to Chicago men his Oro Plata group of mines, Todd Basin. Work goes on in his charge.

PINAL COUNTY.

The Troy smelter is in charge of L. W. Morgan. The iron ore used at the smelter comes from the Buckeye and Beehive mines and carries from 4% to 5% copper. The lime ore will be taken from the Idaho mine.

Kelvin hears that an Omaha company will work the McSherry property and put a working tunnel from the Gila river into the mountain, to crosscut rich mineral, and will connect a tramway with the Phœnix & Eastern Railroad.

The Bryan group of mines, opposite Kelvin, has 3000 feet of development work.

SANTA CRUZ COUNTY.

(Special Correspondence).—The Harshaw mines are prosperous. The Hermosa has been bonded. There is a body of horn silver ore that will average 30 ounces per ton. They have 500 tons ore in sight. The Hardshell mine, owned by R. R. Richardson of Patagonia, has galena ore that assays 400 ounces per ton. This mine has a shaft 400 feet deep.

Patagonia, June 7.

YAVAPAI COUNTY.

The Val Verde smelter is running steadily. Three cars of matte were shipped last week. There is an abundance of ore on hand.

Near Prescott the Briganza Co. has fifty men at work on its Henrietta mine.

W. A. Clark has reduced the day force on the Iron King mine, 2½ miles from Jerome, and will explore the ore bodies with a diamond drill.

T. J. Randal has men at work on the properties of the Verde S., D. & O. P. Co., in Tonto Basin. A tunnel to be driven 500 feet has been started 200 feet below the present workings—to open up a body of sulphide ore, the use of which in the smelter will do away with a previous long haul of iron ore for fluxing purposes.

W. Theising of Cordes has sold four mines to E. A. Frankie of Chicago. Ore from the vein is said to average $25 gold and eight ounces silver per ton, with 10% lead. Mr. Frankie will build a mill.

The sale of the Dos Oris mine, near Prescott, to P. Williams, for $25,000, is reported.

YUMA COUNTY.

The Darling and Bradshaw mines, Quartzsite, will have new machinery and will be extensively developed this summer.

CALIFORNIA.

AMADOR COUNTY.

Following is a detailed statement by Supt. E. C. Voorhies showing time and cost of sinking the Lincoln shaft, Sutter Creek, from a depth of 1260 feet to 2000 feet, 740 feet of incline shaft at 62½° incline, size of excavation 8x17 feet. Work was done by three miners working eight-hour shifts, or nine miners per day, with a day and night foreman, making eleven men employed per day. The work occupied 350 days:

2956 days labor at $2 75	$ 7,129 00
350 days labor day foreman at $4.	1,400.00
282 days labor night foreman at $3.25	916.50
Total labor cost	$ 9,445 50
22.450 lbs. powder used, cost	1,307 25
35,800 feet fuse, cost	125 30
46 boxes caps, cost	46.00
2400 lbs. candles, cost	288.00
148 sets timbers, 207,200 feet lumber, cost	3,729 60
Total	$14,941.65
Cost per foot of shaft for labor of drilling, putting in timbers and shoveling waste into skips.	$12 764
Cost of powder per foot of shaft.	1.766
Cost of fuse per foot of shaft.	.170
Cost of caps per foot of shaft.	.060
Cost of candles per foot of shaft.	.390
Cost of timbers, lumber, per foot of shaft.	5 040
Cost per foot of shaft.	$20.190

Three thousand eight hundred and sixty-four blasting holes were drilled an average depth of 6½ feet each, or $5\frac{2}{10}$ holes per foot of shaft; $3\frac{2}{100}$ pounds 35% and 40% powder were used to each blasting hole, or $16\frac{74}{100}$ pounds per foot of shaft; 9456 tons of rock were broken and hoisted to the surface, being 12 77 tons per foot of shaft. During the time of sinking 14,406,200 gallons of water were hoisted to the surface.

The Live Oak, in Pioneer district, is being worked by Trackwell & Harmon. The ledge is 6 feet thick, with a seam of sulphureted ore 18 inches wide, over $20 per ton.

F. B. Joyce of the Defender mine, Pioneer district, says the shaft is down 350 feet; drifting is in progress. A 10-stamp mill will be built.

The old Gover shaft will be unwatered to the bottom (1500 feet) by July 15. The new shaft at the Fremont mine will then be 1000 feet deep. New hoisting machinery will then be installed at the Fremont shaft.

The Bay State mill, near Plymouth, has closed until stoping is completed.

A strike is reported from the Bunker Hill mine, Amador City, on the 1400 level.

Six men are at work on the old dumps of the Empire and Pacific mines at Plymouth. Four roller mills will be in operation next week.

The west crosscut from the new shaft at the Kennedy mine, from the 2500-foot level, has entered the vein.

Sinking the South Eureka shaft from the 2000-foot level progresses. A level may be opened at the 2200-foot station.

At the Sargent mine, near Middle Bar, a three-compartment incline shaft has been begun on the vein.

BUTTE COUNTY.

F. H. Dakin will visit mines in this county for data as to the depth reached and what is shown by the st ata, to be used in compiling a map to show portions of the ancient river channels, which, it is believed, will afford mines in the same state as the Sweepstake bonanza in the old channel near Weaverville, Trinity county. It is the theory that the fine gold now dredged along the river at Oroville left the ancient channels as nuggets which were broken and ground up in transmission. The Cherokee mine, from which thirteen millions has been taken by washing down a bank with streams from pipes, comprised 4000 feet of an ancient channel. The Magalia mine, which has yielded two millions, was in a lateral channel running iuto that of tbe Cherokee. Here the peculiar pebbles were followed into the hank and a shaft was then sunk through the lava from ahove.

At Berry creek, owing to the failure of water, the Romer & Nordyke mine will be closed until next winter.

Near Magalia the Bader mine has been put in shape for working. It is hoped to acquire sufficient water to wash the gravel.

The Golden Summit mine, the property of Goodall-Perkins Co., is leased to Weaver & Reece, who believe they are in a body of ore.

At the Matheson mine (quartz), near Nimshew, a capping of lava has been penetrated and the ledge exposed.

At the Snow mine work was resumed June 10th.

The mines of the Nimshew G. M. Co., G. L. Smith Supt., employ several men.

H. P. Sophy is reopening the Crystal Peak mines, near Enterprise.

J. M. McClung has men at work on the Lydia mine, near Enterprise.

CALAVERAS COUNTY.

Sloan Bros. of Vallicita are operating the Sloan hydraulic mine and are enlarging their reservoirs.

At the Beatrice mine Supt. Ober is pushing 70 feet a week of tunneling toward the Rohles vein.

The Calaveras mine is being unwatered.

The What Cheer mine will be reopened under the superintendency of J. J. McSorley. A new incline shaft will be run and new machinery put in.

DEL NORTE COUNTY.

A. Quitzow is manager of the Smith River copper mine, 10 miles from Crescent City.

EL DORADO COUNTY.

(Special Correspondence).—The California Jack mine, near Georgetown, is preparing to begin operations under J. T. Wiggins of Los Angeles

C. M. Eye, at the Alpine mine, near Georgetown, is pushing development work. Concentrates and bullion are being shipped to San Francisco.

The Gold Bug mine, near Georgetown, closed down recently.

Georgetown, June 11.

The Bangor Slate Co. at Kelsey is shipping slate. A 5-stamp mill will be erected by the Jas. Beckman Co. on the Patten place, Diamond district.

M. Hughes at the Lucania mine is preparing the lineway for 5000 feet pipe.

The Montezuma mine at Nashville has increased its force of men at work. The rock will average $10 per ton in the 6-foot vein.

C. H. Dunton, manager Eureka Slate Co., says the company expects to spend $50,000 developing the property this summer.

A map and register of the county has just been issued by the State Mining Bureau. With the register is an economic geological map to supply miners and investors with knowledge of the mineral-bearing zone.

INYO COUNTY.

At Camp Lyon, near Ballarat, the 5-stamp mill will be in operation by August 15th.

In the Panamint country the Ratcliff Co. is working forty men and the Mineral Ranch thirty.

The Havilah Co. has ten men at work on the Santa Rosa.

Dean & Jones have thirty men at work on the Argus.

KERN COUNTY.

That the McKittrick sands extend to the southeast for a mile has been demonstrated by the success of the Monarch, the Belgium and the "1901." These sands retain their richness as far as they are now known to reach. A test of this producer shows that the well is capable of yielding at the rate of 170 barrels a day of settled oil. The gravity is light and the quantity of gas contained in the oil is sufficient to cause it to flow continually when the pump is not in operation.

Chief Engineer F. C. Finkle of the California Power Co. will soon start the work of driving the tunnels at the site selected on Kern river; 300 men will be employed at wages varying from $2 to $3 per day.

Bakersfield and Randshurg will have electric light and power. The Kern River Co. will build a canal 12 miles long, capacity 30,000 miner's inches. The line will begin at Kernville and follow the Kern river south 12 miles, where a station of 15,000 H. P. will be built, thence to Los Angeles two lines, capahle of delivering there 10,000 H. P.; length of each line 110 miles.

The Keyes mine at Keyesville has notice that the cutting of wood in the neighborhood of the mine, located in the forest reserve, would be permitted no longer. An appeal was telegraphed to Washington, a statement of the conditions made, and permission granted to continue until some other fuel supply could be obtained.

The Lady Belle mine at Keyesvllle has started. The Hooper custom mill is running on full time.

January 1, 1902, Kern river field had 184 oil wells producing monthly average 322,500 barrels. Last month Kern river field had 241 wells, producing 422,473 barrels per month. In addition are 320 wells "shut in," that is, they could produce if there was a sale for the oil. These wells "shut in" are locally credited with ability to produce an average of 560,960 barrels a month, or 6,731,520 barrels a year.

MARIPOSA COUNTY.

The Cataract & Wide West Co., W. B. Lake Supt., is adding more pipe to increase the pressure, as the gravel is of the cement order.

MONO COUNTY.

The Bodie Miner-Index reports the power scraper at the slum pond of the Standard Co. to be a success. It drags the slimes from places where horses could not stand to firmer ground, where, after drying, it can he taken away. It will save valuable tailings.

In the case of J. B Haggin et al. against J. A. Kelly et al., and the granting of a new trial to the latter, the decision of the Superior Court has been reversed in favor of the plaintiffs. The case involves the title to the North Noonday mining claim, in Bodie district.

NEVADA COUNTY.

The quartz mill at Meadow Lake, which blew down last February, will be rebuilt, ten more stamps and other new mill machinery added.

The mortgage on the Grey Eagle mine, near Nevada City, has been paid. The company will develop the mine.

Good ore is being taken from the Tilley mine, on Deer creek, and crushed at the Nevada County mill.

New buildings are being erected at the Independence mine, Bloomfield district.

Good rock is now being taken from the ledge of the Gold Deposit M. Co.'s claim, Montezuma Hill.

F. G. Drum, general manager of the Union blue gravel mine at North Bloomfield, recently made an examination of the property and found everything working satisfactorily. When the main channel is struck the working force, now fifty men, will be increased.

PLACER COUNTY.

At the Gold Blossom mine, near Auburn, twenty men are at work.

PLUMAS COUNTY.

J. Gruss, at the Gruss mine, Genessee, intends to add fifteen stamps to his mill.

The Cataract M. Co. has twenty men digging a new ditch to lower Indian bar. C. L. Adams, Supt., is rapidly pushing the work to completion.

At Chipps Creek bar, owned by W. M. Cleveland, a water ditch has been added and development begun. At Long bar Cook & Co. are working steadily. An

elevator of home construction is being used.

SHASTA COUNTY.

Berkeley men will form a corporation to develop the Oro Fino, near Shasta; J. T. Mabey president, W. C. Jenkins secretary and W. Moran mine Supt. Six hundred feet of tunnel have been driven, intersecting the vein at a depth of 200 feet. First payment on the property has been made and preparations are being made to put in a 30-stamp mill.

The Great Western G. Co. at Coploy say it is going to put in a 500-ton smelter. Surface ore assays $7.57 per ton.

The Uncle Sam gold mine, near Kennet, is bonded to the Trinity Copper Co., who are reopening the property to use as a flux ore which carries gold.

Two gold bricks worth $27,000 were shipped from the Midas mine, Harrison gulch, this week.

The Port Huron Drodging Co. is at work in the Sacramento river, near Middlo Creek, after a long wait because of high water. Manager A. S. Martin returns from Port Huron July 1st. F. Houlo is in charge during his absence.

SIERRA COUNTY.

The Bellevue tunnel is being run to tap the Thistle Shaft gravel channel below the old works and is going ahead at the rate of 70 feet a week. The tunnel is now in 2700 feet, is in hard slate rock, which requires no timbering, and is of sufficient width for a double track. It is being run by two power drills with compressed air as motive power. The company is employing fifty men under the management of C. B. Wingate.

SISKIYOU COUNTY.

The Porphyry Dike, near Hooperville, has been bonded to the Sheba M. Co. for $10,000. The company will put up a 3-stamp mill.

B. A. Cardwell of the Siskiyou M. & D. Co. of Scott Valley is opening a coal mine near Ager.

H. Matterm is building a 10-stamp mill on Rocky gulch, near Hornbrook.

At Little Humbug the miners are busy, with plenty of water.

C. W. Tyrer & Co. are running their mill near Hornbrook and intend sinking on the ledge.

The dredger at Callahans is worked by an electric dynamo. The company has 5 miles of river bottom. Another dredger may be built to help out the cleaning of the channel clear into the hanks for some distance on each side of the river.

The Keene quartz mine on Boulder creek, south fork of Scott river, is operated hy the cyanide process, leaching sixty tons every twenty-four hours and saving 85% of the gold.

The Greenhorn blue gravel mine is to be reopened.

TRINITY COUNTY.

M. Jones and W. L. Patton, who, with T. O'Keefe sold the Fairview mine to the Altoona Q. M. Co. for $60,000, are traveling. Jones goes to New York and Patton to Nevada. Jones and Patton got $12,000 apiece, O'Keefe $15,000, the remainder being divided between five others.

TUOLUMNE COUNTY.

The Pioneer-Lynn M. Co. is operating the Clio property at Jacksonville.

Seven carloads of ore are being shipped from Cooperstown.

At the Doyle mine at Columhia operations have been suspended until a pump is put in.

D. C. Demarest has bonded the Neuebaumer mine at Tuttletown.

The Equitahle M. Co. Is preparing to resume operations at the Arbona mine. A small furnace for reducing sulphurets is being built.

Drifting at the Bell mine, Tuttletown, has heen resumed since the mine was unwatered.

The Horse Shoe Bend G. M. Co. will drive a tunnel 500 feet on their property near Columbia.

COLORADO.

The Colorado Bureau of Mines has Issued a production bulletin in which the total gold output for 1901 Is given at $27,679 445. Of this sum Teller county contributed $17,232,682, San Miguel county $2 049,471, Lake $1,776,131, Gilpin $1,638,965, Ouray $1,546,322 and twenty-six other counties the remainder. The silver output was $10,901,365. The lead output was 148,111,020 pounds, valued at $6,419,131. The copper product was 7,872,529 pounds, valued at $1,303,297. Other mineral products were: Bismuth 637,200 pounds, or 318.6 tons worth $25,488 at an estimated average of $80 per ton, less transportation and treatment charges. The coal output was 5,928,410 tons. The Colorado Fuel & Iron Co. of Pueblo report 704,737,735 pounds of iron handled, and an output including 330,364,725 pounds of pig iron and 309,092,982 pounds of steel rails. Nine counties produced 26,843,731 pounds of zinc, worth $1,095,225. Lake county produced 23.167,140 pounds of this. A comparative table gives the total gold product to date of $279.568,211, and that of silver as $363.644,403. Lead production began in 1872 and has amounted to 2.575,958,388 pounds, valuod at $107,491,511. The copper product amounts to 108,982,515 pounds, valued at $14,634,087. The total value of the gold, silver, lead and copper products to the end of 1901 is given at $765,338,253.

BOULDER COUNTY.

Near Boulder the Logan mine, operated by the Clinton Co., in the lower tunnel, 900 feet deep, has ore worth ten ounces gold per ton.

Tho old American mine at Sunshine has a body of ore. A part of it leased by the Vinango M. & Red. Co. to Hendrick & Co. is showing ore.

It is locally reported that a cash offer of $60,000 has been made for the Balley chlorination works at Eldora.

CHAFFEE COUNTY.

At Buena Vista Manager Morley has laid off all the men at the smelter, closing the plant. He has sent his resignation in to the company at Philadelphia to take effect immediately. It is reported that the American S. & R. Co. has control of the plant and closed it. As the plant stands to-day it represents $150,000. It was completed in 1897 and has been in almost constant operation. Last December it was burned to the ground and was rebuilt at a cost of about $60,000 and only been running a few weeks. The closing of the plant throws fifty men out of employment.

At Manoa the Sunset Con. Co., C. Higham manager, expects to put on machinery. A shaft is being sunk at the intersection of two veins which cross each other at an angle of thirty degrees. The company owns 5000 feet of these veins, showing sulphides.

CLEAR CREEK COUNTY.

The Freeland Extension mine, at Idaho Springs, recently sold for $100,000 to South Dakota mining men, will be extensively worked this season.

At Georgetown, the new plant at the Capital Prize tunnel has been installed under the supervision of G. J. Hite and is in operation.

At Empire new concentrators and added power at the old mills will give the Empress, Conqueror, Atlantic and Clear Creek chance to daily handle 180 tons. Erection of private works by the Republic group of owners in Lyon gulch, the Woodbury Co. on Breckenridge mountain and the new Republic Con. near the Empire station would provide treatment for 150 tons that would otherwise require transportation to outside mills. The Gold Fissure output is going to the Clear Creek plant, thirty tons per day.

The Freeland Extension mine at Freeland is sold to South Dakota men for $100,000. The shaft has been sunk 400 feet.

The new independent sampler at Black Hawk is locally credited with intention to evade the trust by shipping their product to the Black Hills smelter, and the Burlington railroad have made the company rates that will make it profitable. The shipping distance is 400 miles.

Georgetown reports the Santiago strike of ore shows three to seven ounces gold per ton. There are 3 feet of yellow copper ore that runs three ounces gold, ninety ounces silver and 15% copper.

Manager Yeager of the M. & M. Co., Idaho Springs, contemplates the erection of a larger plant of machinery this summer.

The management of the Central tunnel furnishes the Georgetown Courier the following figures on last month's work of 161 feet labor and expense account:

Drill crew (three drill runners, two helpers)	$17 00
Powder crew	6.50
Muckers and trammers (five)	13 75
Foreman (one)	3 50
Engineer (one)	3 50
Blacksmith and helper	7.00
Total	$51.25

Twenty-four shifts drove 161 feet; average 6.7 feet per day; cost per foot $7.85.

Sinking the Mendota shaft goes on. In the west drift in the hottom is a 4-foot streak of solid lead ore that runs over 60% lead and thirty-five ounces silver. This is taken out and shipped without sorting.

Georgetown reports an important gold strike from the Santiago, a comparatlvely new mine, near Georgetown. At a depth of 200 feet an experimental shot is said to have disclosed a 14-inch vein of decomposed mineral which gives assays of $675 per ton. In addition is 2 feet of mineral carrying a value of from $140 to $190 per ton. The Santiago has shipped 2-ounce to 4-ounce ore from its second level.

Matters are still at a deadlock regarding resumption of work on the Newhouse tunnel, which, starting near Idaho Springs, extends 14,000 feet into the mountains and cuts the formation at a depth of 2000 feet. It will be extended no farther, unless an agreement is reached with the owners of mines and those benefited by the work to pay the tunnel company for its services. It was the intention to push the tunnol 1 mile farther than it has yet penetrated. In the aggregate it would cut about 300 veins. All such properties would be drained, and thus the cost of pumping water and a part of the expense of bringing ore to the surface would be saved.

At Empire, work that had been suspended on the Covode Mountain Co.'s property awaiting completion of surveys and patents upon the groups owned by it on the east slope of the mountain has been resumed.

Lindsay & Co. are shipping surface quartz from the Comet property, Silver mountain, to the Atlantic mill, where the method of treatment combines amalgamation and concentration, the saving of the coated gold that has hitherto proved refractory to amalgamation being effected by chemically prepared quicksilver.

The Freeland Extension mine is turned over to the Freeland Extension M. & M. Co., headquarters Mitchell, S. D., consideration $100,000, one-third cash. J. A. Wilson will be Supt.

CUSTER COUNTY.

Custer City, a full-grown town, with all the trimmings, has been formally opened near the Bassick and Hector mines, 8 miles east of Silver Cliff. The houses were built in sections, shipped by rail to West Cliff and tben by teams. Speeches, music and feasting were the features of the opening celebration, the principal speaker being ex-Governor A. Adams. A. A. Pope of Boston, Mass., is a backer of the new town.

EL PASO COUNTY.

The Telluride Reduction Co., at Colorado City, is receiving ores. C. D. Grave is superintendent. The process is hromination.

General Manager Fullerton says the Telluride Reduction Co. has opened its mill at Colorado City.

FREMONT COUNTY.

At Florence the Beam mill will resume operations. It was owned by a Chicago stock company, has a capacity of seventy-five tons per day, and will be sold to Cripple Creek men, who will change it to a cyanide plant and increase its capacity.

At Canyon City the old American zinc-lead smelter, recently bought by the United States Reduction Co., is being enlarged. The new laboratory will be equipped for assaying and experimental work. D. Jackling is manager, A. R. Nicholls Supt.

Near Canyon City an English organization, capitalized at $2,500 000, has forty-eight claims, the old Montezuma territory. The members of the old Montezuma company are to receive a cash bonus and an allotment of shares in the new company.

At Florence the United States Reduction & Refining Co., which owns the Union mill, has declared a dividend of $120,000. The plant resumed operations last August, and since that time $300,000 in dividends have been declared.

GILPIN COUNTY.

Central City hears that work is to be resumed in the breast of the Newhouse tunnel.

In future all work at the Gregory-Bobtail, Cook and Fisk will he on day's pay or by contract. The leasers are accordingly getting out ore fast. The Boston & Denver Con. M. & M. Co. has men arranging for the tramway which carries the ore from the Cook property through the Bobtail and Bates tunnels to the new mill. The lower levels of the Fisk and Gregory workings will be connected with the Cook shaft; the latter now 900 feet will be made 300 feet deeper. The mill has forty stamps running on the ores of the group.

Drifting is going on in the 190-foot level of the Hayes & Wheeler mine at Spring Gulch, where the leasers have opened up a 2-foot crevice and are making a trial shipment to the Hidden Treasure mill; also will ship a carload to the Golden smelter.

In the 240-foot east and west levels the Gauntlet G. M. Co. are taking out ores carrying copper and lead. The product is shipped to Golden. The shaft will be sunk 100 feet to the 400-foot level.

GUNNISON COUNTY.

At Pitkin, in the Gold Cup mine, there are 500 acres patented ground on Gold hill. The workings consist of an incline shaft sunk 900 feet at an angle of 30°, with levels run every 100 feet. A contract has been let for 200 feet of drifting and crosscutting from the ninth level.

Near Gunnison the Ruby King mine is sold to the International M. Co., Providence, R. I. S. I. Tingley is in charge and has begun work.

H. C. Shump, secretary Colorado Mines Con. Co., at Parlyn, will work that property this summer.

HINSDALE COUNTY.

Work is resumed at the Hidden Treasure mine and mill, near Lake City. J. McCombe is manager.

At the Moro mill Manager Carr will soon resume. B. N. Ramsey has resumed operations on the Little Chief.

LAKE COUNTY.

A recent shipment of ore from the St. Kevin mine brought $22 per ton; treatment, $9; hauling, $2 25.

The Fanchon mine has considerable ore in the bins that assays fifty ounces silver and one fourth ounce gold.

E. C. Englehardt will have charge of the metallurgical operations of the Harrison Reduction Co., which will work over some old dumps at the foot of Harrison Ave, Leadville.

In '79 and '80 smelting was crude; recovery not as good as to-day. All that was looked for was ore that run $30 per ton and 20% lead. All under this was thrown over the dump. The smelting charges were $30 per ton, less 10% on the New York price of silver; lead brought 50 cents for each per cent over 30, with a reduction of 50 cents for each per cent under 30. Ore that ran fifty ounces silver and 40% lead would hring at the smelter $24 50 net per ton. Nothing was allowed for gold, and the moisture ran from 20% to 50%. In 1879 the output for Leadville was 110,483 tons, value $10,504,106, or a value in pure silver and metallic lead of $95 per ton. Many thousands of tons of ore that could not stand the enormous cost of smelting were thrown over the dump.

At Leadville, W. H. Jones of the Cloud City Co. says as soon as macbinery can be secured and placed in position that property will resume operations.

By Sept. 1 Leadville expects that the Colorado Fuel & Iron Co. of Pueblo will be in a position to take a large amount of manganese for steel and iron from the Leadville mines.

At Twin Lakes the Blaine Electric Mining & Power Co., W. H. Applegate manager, A. Simons Supt., project development of thirty veins in the Willis gulch country, the building of a new town, etc.

LAS ANIMAS COUNTY.

At Rincon the Colorado Fuel & Iron Co. has put in 1200 new coke ovens. It has a railroad to Primero, 16 miles up the river, recently completed to Rincon, 20 miles farther, at the foot of the Sangre de Christo range. At Primero the daily output is 5000 tons. The camp has now a population of 700. At Segundo, 2 miles away, 900 coke ovens have been built and are in operation. From Rincon a railroad survey has been made 20 miles farther west into Ponil park.

MESA COUNTY.

The Western Slope Copper M. & S. Co. will erect a smelter at Grand Junction.

OURAY COUNTY.

At Ouray the Camp Bird Extension Co. proposes to put in a new concentrating mill.

Ouray reports prospects for starting up the Home Pyritic smelter in the latter part of this month.

PARK COUNTY.

Near Alma, the Alma Safe Deposit, Rhodus and Cincinnati placers are working. The Snowstorm Hydraulic Co. is employing sixty men on new ditch and flume work, to get a head of water at the Snowstorm and Beaver Park placers.

A new mill will be built to treat Kentucky Belle ore, up near the head of Buckskin gulch.

Work is to be resumed on the old Russia mine, Mt. Lincoln, and an aerial tramway built to bring the ore down.

A two years lease has been secured on the Champaign mine hy J. Moynahan, B. F. Shoemaker and C. S. Elliott, of Alma, and work has already started.

SAGUACHE COUNTY.

The Goldmont M. & M. Co., owning the Chicago group of lodes near Idaho Springs, forty-two in number, is consolidated with the Goldmont Co.'s holdings near Alder, on the Denver & Rio Grande Railroad, 20 miles from Salida, where the company has twenty-seven lode claims and 320 acres of placer ground. The placer property has been platted into a town site. On the lode claims $10,500 has been spent since January.

SAN JUAN COUNTY.

Mgr. Kendrick of the Oliver Reduction Co., Picayune gulch, Silverton, says that the Mexia vein is 24 feet wide, and carries a concentrating ore that is worth $12 a ton.

Near Silverton a 500-foot contract was let on the Highland Mary property to run a tunnel from Cunningham to cut the Lookout vein. A new mill will be built.

The Eureka Exploration Co. is working the Silver Wing mill, 2 miles above

Eureka. The product of the Silver Wing mine and Frederica mine is being concentrated.

F. McGuire and associates are running a tunnel on Tower mountain near Eureka to cut the Skookem vein.

A 600-foot tunnel will be driven on the Climax vein under direction of M. S. Beach.

J. L. Estey has bought a millsite and will erect a concentrating plant.

The new addition to the Judge Terry mill in Eureka will cover twenty extra stamps.

SAN MIGUEL COUNTY.

Near Telluride a canvas table plant will be operated at the Alta mine for treating tailings from the mill. These tailings carry gold, silver and lead, the determined assay valuation being 1 62 ounce gold, 42.9 ounces silver and 24 16% lead. This plant will mill $7 ore. The concentrate products of the Gold King, one of the Alta properties, run about ¾ ounce gold, 39 ounces silver, 26% iron, 12% lead, 12% silica and 3% copper, the concentration being five and one-half to one.

At the Silver Bell mine are framed timbers for the 30-stamp addition to the mill at Ophir loop. The Liberty Bell has 200 men at work in the mine. The mill is working eighty stamps.

At the Liberty Bell mine, near Telluride, as a safeguard against further slides, Superintendent Chase is building a big snowslide crib to turn the embryo avalanche down the gulch. The crib is of heavy logs and filled with rock, is 80 feet long, 12 feet wide, 14 feet high.

The Smuggler-Union Co. has 400 men on the pay roll at the Bullion tunnel and Sheridan workings.

SUMMIT COUNTY.

The American Gold Dredging Co. is operating a Bucyrus dredger in the Swan valley and has begun work at the mouth of Galena gulch with giants and sluices.

The Oro Grand G. M. Co. is putting down a pit to the bedrock in the Blue river valley near Dillon.

The French Gulch Placer M. Co. is operating a double hydraulic elevator.

The Peabody placer, in the Gold Run district, a large producer of nugget and coarse gold, is operating with hydraulic giants and sluices.

TELLER COUNTY.

In the Cripple Creek district the volume of water flowing from the Standard tunnel has been accurately measured. There flowed 7500 gallons a minute for two years—450,000 gallons an hour and 10,800,000 gallons in twenty-four hours for two years, 7,884,000,000 gallons.

Sulphide roasters are in action in the Cripple Creek district at the Economic mill, controlled by the Woods Investment Co., on an experimental run.

At Colorado Springs answer has been filed by the Strong G. M. Co. to the complaint of the Stratton's Independence, Ltd., which is suing to recover $1,750,000 for ore alleged to have been extracted from the Independence grounds. The answer alleges that the apex of the Strong vein is located between certain planes and lines on the Strong claim; and that all ore which has been extracted from Stratton's Independence ground has been taken legitimately in following the vein on its dip.

E. M. De la Vergne, general manager Isabella mine, thinks that the deep drainage canal proposed for Cripple Creek is taking definite form and should be built. It is proposed to run a tunnel from the southwest under Grouse mountain, starting 3 miles southwest of the Elkton mine, near where Cripple creek joins Four-Mile creek. Such a tunnel would cost approximately $300,000 and would take five years to construct. It would cut through the Elkton and several other mines at great depth. An original survey has been made and movement made to raise the capital.

At Independence the Glorietta lease on the Hull City placer made a production of 140 tons of ore in May; average value $35.

The Hannah Britt, west slope Bull hill, operated by the Practical G. M. Co., has reached the depth of 525 feet in the shaft. The upper levels have produced rich ore.

Manager Bainbridge of the El Paso Con. Co., on Beacon hill, is daily producing thirty tons ore. On Sept. 15 the new machinery goes in.

C. Waldon has a two-year lease on the Chickenhawk, August Flower and Hobo claims of the Katinka G. M. Co., adjoining the Mary McKinney on the south. He agrees to sink a 4x12 shaft, in the clear, to a depth of 700 feet. It will reach the vein at 600 feet.

Supt. McCarthy of the Granite mine on Battle mountain reports ore on the 1000-foot level that will go $100 gold to the ton.

The Isabella Co. of Cripple Creek has sold its Snow Bird fraction for $7500 to C. W. Kurie of Colorado Springs.

The Oneida mill, 1½ mile southeast of Victor, was destroyed by fire on the 7th inst. It was built three years ago by a New York firm at a cost of $100,000, to treat low-grade ore. It was only operated for a short time after its completion and had been idle ever since.

IDAHO.

ADA COUNTY.

Connection has been made with the vein on the Last Chance group, Boise City, at a depth of 250 feet. The company will double the capacity of the mill.

BINGHAM COUNTY.

In the Fort Hall Indian reservation 500,000 acres are to be opened for public entry June 17. Ninety-seven thousand acres are classed as agricultural, the balance being classed as grazing, but being a hilly and mountainous region known to be seamed with mineral veins carrying copper, gold and lead. Under the President's proclamation all the lands except those within 5 miles of Pocatello will be opened to public entry under the homestead, town site, mining, stone and timber laws of the United States, except that the agricultural lands will be entered at $2.50 per acre, the grazing at $1.25 and the mineral at $10 per acre. The opening will occur at noon on Tuesday, June 17.

BLAINE COUNTY.

Dowe & Beekman of New York had a lease and bond upon the holdings of the Hollister syndicate on the Hailey gold-copper belt—the Crœsus, the Big Camas, the Hattie, the Golden Star, and the Montana groups, which the Hollister syndicate had control of under options to purchase, and upon some of which it had made payments and spent $50,000. The Hollister people were to pay $350,000 for the Crœsus. Dowe & Beekman did no work except to grade and build the masonry for a 40-stamp mill. They have quit. The Hollister syndicate will probably resume operations.

CASSIA COUNTY.

A dredger is in operation at Basalt and considerable sand is being raised.

IDAHO COUNTY.

In Florence placer miners are running day and night, taking advantage of the present abundant water supply, and the output of dust will exceed that for many years past. On the Banner properties a small crew is at work. Florence is nearly depopulated consequent upon reports of rich ledges of free gold bearing quartz in the Marshall Lake country south of Salmon river. The present excitement is confined to Bear creek. The Marshall Lake country is a part of Florence mining district.

The Purdum Co. will put in a 40-stamp mill.

OWYHEE COUNTY.

At Silver City, work on the extension of the De Lamar mine is resumed. R. D. Morkill is in charge.

SHOSHONE COUNTY.

At Mullan the Snowstorm M. & M. Co. has let a contract for an additional 600 feet of development work.

The Monarch M. Co., near Murray, has 40 feet of ore, 7 of which is galena, the remainder concentrating ore.

The War King tunnel, to tap the lead at a depth of 200 feet below the old tunnel, is in 351 feet.

MICHIGAN.

HOUGHTON COUNTY.

The Calumet & Hecla Co.'s secretary, G. A. Flagg, has finished a report in which he states that the product of the mine has been generally rated at 93,000,000 pounds, while it was really producing about 70,000,000 pounds per year. Last year the Calumet & Hecla produced 74,510,557 pounds of copper; the previous year, 77,761,382 pounds.

MONTANA.

FERGUS COUNTY.

Ore is reported in the drift from the shaft on the Barnes-King mine at Kendall.

Satisfactory work is being done by the hoisting and pumping plant of the Kendall G. M. Co.

The Burke & Sweeney sapphire properties on Yogo creek are bought by the American Gem Mining Syndicate for $50,000.

FLATHEAD COUNTY.

There are 300 men in the camp of Cabinet on Fisher creek, 40 miles south of Libby.

Kalispell reports a strike in one of the Sullivan mines on the Stillwater river. Prospectors and others have gone over from Great Falls, and claims will be taken up in the vicinity.

GRANITE COUNTY.

The properties of the Montana G. M. Co., near Princeton, are in charge of C. F. Chapin of Butte.

In Garnet, the Mussighrod mill is running steadily and the mines being operated by the same company are being developed constantly and continue to yield well. The Grant & Hartley claims are being developed on a more extensive scale.

LEWIS AND CLARKE COUNTY.

The U. S. Supreme Court has decided in favor of the St. Louis M. & M. Co in the suit with the Montana M. Co. The properties are at Marysville. The litigation between the two companies is of years' standing. The St. Louis Co. filed suit against the Montana Co., alleging that the Drum Lummon vein apexed in its ground, and asked value of the ore extracted by the Montana Co. There are two causes of action, though they were each based on the same claim. In one it was set forth that the value of the ore extracted was $23 000. In the other it was claimed that the value of the ore was $230,000. The two causes were based on the fact that the vein broke on the side line of the St. Louis claim. In the trial in the Circuit Court, before Judge Knowles, the jury found in favor of the St. Louis Co. on the $23,000 claim, and Judge Knowles found for the Montana Co. on the larger claim. The Montana Co appealed to the Circuit Court of Appeals from the decision against it, and the St. Louis Co. appealed from the one adverse to it. The Circuit Court of Appeals decided both cases in favor of the St. Louis Co. In one it affirmed the judgment for $23,000 and in the other it directed that the lower court give a rehearing in the suit for larger damages, for the purpose of fixing the value of the ore extracted. From both of these decisions the Montana Co. appealed to the United States Supreme Court. The question at issue was, Was there a federal question involved, so that the Supreme Court had no jurisdiction? The counsel for the St. Louis Co. held that no federal question was involved. The Supreme Court has decided in their favor, and holds that the court of last resort is the Federal Court of Appeals suit at San Francisco.

MADISON COUNTY.

The Montana C. & G. M. Co., which has been doing extensive development work at Ballarat, near the forks of Stone creek, has consolidated with the International C. & G. Co., a corporation organized under the laws of Arizona, capitalized for $3,000,000.

Near Norris Manager Knox has twenty men at work in the Revenue mine.

Ore is being shipped from the Boar worth $50 per ton in gold.

The Red Bluff mine is being developed under the supervision of T. G. Austin, who has sixteen men at work.

The Norris M. Co. has been organized by Baltimore and New York men who have bought the Comstock group of five claims, 2 miles east of Norris. They intend to erect a 10-stamp combination mill and sink the shaft to the 300-foot level.

The Montana Boy property is to go to the Boston M. Co., composed of Minnesota men. It has on it a 20-stamp mill and hoisting plant. The new company will add a concentrator and cyanide tank to its plant.

At the Galena mine twelve men are employed.

Assays running $147 a ton have been produced by the Lehigh mine at Virginia City, the property of H. Elliott.

In the Revenue mine at Richmond Flat, near Virginia City, forty-two miners are employed, the vein is 2 feet wide, and runs $128 per ton.

At Stateline, on the Big Fourteen group, G. H. Smith has a $42,000 option.

MISSOULA COUNTY.

W. E. R. McDonald, Supt. Vermillion Placer M. Co., says the company is working its ground and taking out gold. He has constructed a pipe line 3825 feet long, through which water runs from Cataract creek to the ground. The company owns the water of Cataract creek, which during the dry season carries 1800 miners' inches of water per minute. The pipe line has a fall of 125 feet and furnishes enough water to run two No. 2 monitors. It cost $4000.

SILVER BOW COUNTY.

The reason given for the closing down of the Anaconda mine is that the old fire in the St. Lawrence mine, which has been smouldering for thirteen years, has broken out afresh and created so much sulphur fume and gas as to compel a temporary suspension of work in the Anaconda.

At Butte, on the 7th, J. E. Moen, a shoveler at the Rarus mine, while at work on the sill floor of the 1100-foot level, was instantly killed by the explosion of a stick of giant powder, which he struck with his pick while loosening a quantity of rock before shoveling into a car.

NEVADA.

DOUGLAS COUNTY.

T. F. Phelan of Bridgeport, Conn., principal owner of the Sayers mine at Sweetwater, will complete the mill now on the ground and expects to begin July 1.

ELKO COUNTY.

The Dexter M. Co 's report from Tuscarora the output for May to be $14,000 gold.

EUREKA COUNTY.

There is talk in eastern Nevada of a plan to extend the Eureka & Palisade railroad from Eureka via Hot Creek, Nye county, to Tonopah, 150 miles, and to build a smelter at Hot Creek, 90 miles south of Eureka.

The shipments of ore by rail from the mines of Eureka district for the week ending June 6 were as follows: Bullwhacker, 45,650 pounds; Diamond, 139.140; Eureka Con., 178 500; Jackson, 36,430; McGarry, 22,420; Richmond, 30,000. From Hamilton: Rocco-Homestake, 274,640.

LINCOLN COUNTY.

The Rambler and Emma mines, in Searchlight district, are reported sold so G. Baker for $20,000.

"A local mining man" tells the Salt Lake Tribune that a consummation of the million-dollar De Lamar deal would be followed by contracts for a mill that will equal the big plant operated by the Con. Mercur. The site, according to this authority, is to be that occupied by the present mill, the outlet for all the ores to be fed to the mill, the No. 10 tunnel, through which the reorganized company's entire holdings will be ultimately tapped.

An $80,000 option has been given on the Mendha group, near Pioche. There are 1000 tons of ore on the dumps that will yield $28 in gold, 18% lead and ten ounces of silver per ton.

The April Fool Co. has bought the Pat Ryan interest in the Gold Cup claim, an extension of the April Fool. This gives the company over two-thirds interest in that claim. The mine contains large bodies of low-grade ore, and tests made by the process which is now being adopted has demonstrated that the ore can be worked at a profit.

The railroad of the Quartette Co. at Searchlight is completed; trains make two trips daily from mine to mill.

NYE COUNTY.

Tonopah reports a strike 6 miles south of the camp, in which the ores assay $800 gold per ton.

The Tonopah Bonanza reports work begun on a 500-foot deep double-compartment shaft on the ground belonging to the North Star Co., J. McCambridge Supt.

Manager Curtis of the Fraction is sinking a triple-compartment shaft, one in the center of the company's group.

The double-compartment shaft on the Silver State, the property of the newly formed G. & H. Tunnel Co., is being sunk by three shifts of miners to a depth of 600 feet.

The Tonopah Water Co. is piping water. J. R. Duffield is manager.

STOREY COUNTY.

At the Savage mine, on the 425 level, from the Gould & Curry tunnel, they are cutting out for chutes, airway and manway in the raise above the north drift from No. 2 east crosscut. This work will be completed during the coming week and raising resumed. In this work there have been saved twenty-seven mining cars of low-grade ore, which has been placed in the dumps of the Best & Belcher mill. The average car sample assay was $6.27 per ton.

F. Leonard Jr. says he will make final arrangements for the extension of the Sutro tunnel south lateral branch to Silver City.

Supt. Gorham of the Chollar, Potosi and Savage mines will put on two more shifts of men at the drilling plant in Potosi ground, on the Brunswick lode.

At Virginia City the drill on the Brunswick has reached a depth of 670 feet and is in clay.

WASHOE COUNTY.

Since J. Sparks has owned the Wedekind mine he has had thirty men locking out ore to run through a leaching mill with a daily capacity of thirty tons. The mill is ready to start up. It will be run by electrical power.

The Sparks M. Co. will give a fiesta at the mine next week to celebrate the opening of the new mill. Cattle and sheep will be slaughtered for a big barbecue.

NEW MEXICO.

GRANT COUNTY.

C. P. Laughlin is at Silver City to superintend work on the Whitewater group, Burros district.

The Santa Rita M. Co. is working on the long cross-country drifts, northerly from the Santa Rita shaft, near Santa Rita. The company is shipping thirty cars copper ore per month. The leasers are running out forty cars per month.

LINCOLN COUNTY.

The New Mexico Development Co. is organized by W. A. McIvers of Nogal to drill for oil. The company owns nearly

1000 acres of oil lands in Lincoln county and will operate a steam drill, capable of drilling 3000 feet.

SANTA FE COUNTY.

The smelter at Cerrillos has shut down temporarily on account of lack of ore.

SOCORRO COUNTY.

E. Cralg, owner and manager Last Chance property in the Cooney district, will take personal charge of the oporations on his property. He will increase capacity of pulp tanks so that mill will have capacity of seventy tons per day.

OREGON.

BAKER COUNTY.

Near Sumpter, a 20-foot blind lead has been cut by the crosscut of the Alamo mine, 700 feet from the mouth.

Manager McPhee, of the Golden Wizard, Minersville, property, is estimating the cost of a mill to treat the ores. The shaft at the mine is being sunk.

An electric plant for power and lighting the Copperopolis has been put in on Dixie creek by the Copperopolis Co. It is used for operating a Durkee electric drill.

Work has begun on the Yankee Boy property, near the Copperopolis, a gold-copper property. It is the purpose to drive 500 feet without stopping.

The new town of Greenhorn has sprung up in the Greenhorn mountains and is absorbing the old town of Robinsonville.

GRANT COUNTY.

Johnson and Jarvin at Granite are examining the Climax and Scandia Tunnel properties to choose a tunnel site for a 600-foot tunnel to be run on the Climax group, near Granite. The Scandia tunnel is now in Quebec hill 1600 feet and has reached a depth of 770 feet. It has 250 feet yet to go.

JOSEPHINE COUNTY.

Stewart & Banfield at Boland creek report another strike on their quartz property.

C. L. Mangum, Supt. Granite Hill mines, Louse Creek district, says he has resumed operations. Specimens from the Granite Hill mines received the bronze medal award at the Charleston exposition.

Grant's Pass reports a rich copper strike in the upper Chetco district, in the southern part of the county, extending across the line into Del Norte county, Cal. Much of the rock carries copper values of 30%. The ore was taken from the claims of J. S. Crawford of Denver and associates.

LANE COUNTY.

The present stamp capacity of the Bohemia district is 63 stamps: Noonday 20, Helena 10, Musick 10, Champion 10, Star 5, Stocks & Harlow 5, Tom Johnson 3.

New machinery will be put in at the Helena, Star and Musick mills for concentration of ores; the capacity of the latter will be increased from thirty tons a day to fifty. P. J. Jennings, Helena M. Co., is manager.

SOUTH DAKOTA.

CLARK COUNTY.

Work is under way on several properties in the Garden City district. The Penobscot M. Co. has started considerable work. The Garden City M. Co., owner of 100 acres of ground, will continue work.

The Gold Hill M. Co.'s shaft shows ore. It is the intention to catch it at depth.

The Minneapolis M. Co. will ship ore from a long incline.

LAWRENCE COUNTY.

At Lead the new Ellison hoist is the largest in that region. Eight boilers furnish 2000 H. P. There is a 300 H. P. engine to run the four rock crushers and an air compressor capable of driving 300 machine drills. The ores will be drawn by air motors from the holst over a trestle which extends across the gulch to the mills. The trestle is steel, ¼ mile long, 100 feet above the ground.

PENNINGTON COUNTY.

A free gold strike is reported near Keystone, owned by E. H. Flynn, on Mt. Ætna, 300 feet from the Holy Terror mine.

The National smelter, at Rapid, has one matte furnace in commission, and will increase its production by the blowing in of a lead furnace as soon as sufficient suitable ore is received.

UTAH.

BEAVER COUNTY.

Covert, Buchanan and Ryan have sold the Klondike mine to the Ben Harrison M. Co. for $20,000—$2500 down, $3000 per month until paid in full.

The Black Rock Copper M. & M. Co. will put in a hoist on its property in the Beaver Lake district.

JUAB COUNTY.

J. M. Ferguson, manager Miners' Supply Co., Robinson, will rebuild the plant recently destroyed by fire.

Sandstone carrying $10.50 in gold is reported in the Orient, in West Tintic. T. R. Powers is president of the company.

P. J. Daley, operating the Beatrice, near Silver City, has ore which assays 121.2 ounces silver, $2 gold, 12% lead.

At Silver City the crushers at the Tesora mill are running on ores from the Alaska M. Co, between which and the plant everything is moved by gravity. The ore consists of a sulphide of iron carrying copper and gold, with a light percentage of lead.

SALT LAKE COUNTY.

Bingham mine managers think they should have a reduction in the tariff to the valley smelters. At present the tariff on ores where a fixed tonnage is proscribed is 50 cents per ton. The shippers want a 35-cent tariff. On coke they want the $8.50 reduced to $7 per ton, and the tariff on lime rock reduced from 40 cents to 25 cents per ton.

TOOELE COUNTY.

Leaching of ores has been resumed at the Sacramento Company's mill at Mercur.

The Nebraska group at Stockton has 200 miners on the pay roll.

WASHINGTON.

OKANOGAN COUNTY.

Supt. E. P. Gaillac of the Beaver Lake mines, 7 miles south of Chesaw, has 8 feet of copper-gold ore in a tunnel, 100 feet from the surface. A crosscut drift has started from the tunnel to cut across the ledge at right angles.

WYOMING.

ALBANY COUNTY.

The smelter for the Rambler mine is being unloaded at Laramie.

CARBON COUNTY.

Supt. W. C. Leadbetter of Battle Copper Co. has begun work on the company's copper property at Battle Lake.

Near Grand Encampment 10 miles of the tramway to connect the Rudefeha mine with the smelter have been completed; 6 miles remain. Men are shoveling snow to lay tower foundations. The tramway will be in operation Sept. 15.

FOREIGN.

BRITISH COLUMBIA.

A. I. Goodall, manager Boston & Montreal Co.'s smelting plant at Boundary Falls, expects to blow in a furnace July 1.

Manager Graves of the Granby Co. will have an air compressor in the Granby Co.'s mines in Phœnix, to be run by electricity and to cost $60,000.

The total production of lead in the Dominion for the year ending June 30, 1901, was 50,756,440 pounds. The total value of gold mined during 1901 was $24,462,222. The lead contained in ore exported from Canada during the same time amounted to 65,602,338 pounds, valued at $2,517,084.

The Tacoma Steel Corporation has bought 1760 acres of mineral land on Barkley sound, Vancouver island, for $20,000 cash and $40,000 in capital stock of the company. President Hewitt of the Tacoma company states that the first move in the development of the iron industry will be the erection of a 150-ton daily capacity smelting furnace in Tacoma. The ore, he states, is a magnetite, running from 64% to 70% metallic iron, contains little phosphorus and lime as high as 7%.

At Rossland the Le Roi is shipping ore from the dump at the old workings. It contains 80,000 tons of ore, on which the company expects to realize $1 a ton. Five hundred tons daily will be shipped to the Northport smelter.

MEXICO.

The Mexican government is about to pass a law placing a heavy penalty upon the stealing of ores from the mines by the employes. It is stated by mine owners that some employes cause considerable loss by carrying off rich specimens of ore, which are concealed about their persons.

CHIHUAHUA.

At Panuce de Avino is being changed the mode of treatment. A leaching plant will be erected in place of the plant now on the ground.

The construction of the new sampling works for the Campania Metalurgica de Torreon has begun.

SOUTH AFRICA.

Pretoria reports that a proclamation has been issued substituting a tax of 10% on the net profits of mining operations for the 5% tax that was imposed by the late Volksraad.

YUKON TERRITORY.

The cost to the Government for the maintenance of the land offices on the Yukon was $21,391.76. There was but a single application and a fee of $10. The offices have been abandoned.

Personal.

C. E NASON is Supt. Marble Co., Custer, S. D.

WM. CASTLE is now Supt. Keltz mine, Tuolumne, Cal.

P. M. MCCREE is Supt. Blackbird M. Co., Blackbird, Idaho.

D. C. JACKLING of Canon City, Colo., is in Salt Lake City, Utah.

JNO. R. PARKS is examining the Oro Fino mine, Sumpter, Oregon.

A. S. MCLEOD is now Supt. Cashier mill, near Breckenridge, Colo.

J. GALLAGHER has resigned as Supt. Hazel Dell mine, Tuttletown, Cal.

ARTHUR KEDDIE has been appointed Deputy U. S. Surveyor, Reno, Nev.

D. E. BIGELOW has returned from Cedros Island to San Francisco, Cal.

G. W. KIMBLE of Placerville, Cal., is examining mining property in Idaho.

LIEUT.-GOV. J. H. NEFF has returned from Auburn, Cal., to San Francisco.

GEO. H. ROBINSON, manager Heinze interests in Montana, is visiting Utah.

C. F. CHAPIN of Butte is now manager Montana G. M. Co., Princeton, Mont.

JAS. H. KIRK is Supt. of mines for the Cananea Con. M. Co., Sonora, Mexico.

S. E. BRETHERTON is now metallurgist for the Val Verde, Arizona, Smelting Co.

C. C. NOPPLE is now in charge of the Phœnix mine and mill, Sumpter, Oregon.

S. E. WARE, Supt. Swansea M. Co., Tintic, Utah, has returned from California.

G. S. BINKLEY, manager Esperanza mines, Cedros Island, is in Los Angeles, Cal.

E. H. TEATS has returned from Albina, Dutch Guiana, South America, to Denver, Colo.

F. J. CONROY is now consulting engineer for Belle of Thunder Mountain M. Co., Idaho.

WM. APPLEGATE, president Blaine M. Co, Twin Lakes, Colo., has returned to the East.

PHILIP DEIDISHEIMER of San Francisco is examining Tonopah, Nev., mining property.

THOMAS JONES, formerly Supt. Marion M. Co, Mercur, Utah, has gone to Tonopah, Nev.

R J. ANDERSON, manager Swsepstakes M. Co, Trinity county, Cal., is in San Francisco.

W. STUART SMITH, U. S. N., retired, has returned to San Francisco from Cavite, P. I.

J. L. GOODMAN has been appointed Supt. Hampton Lead Co., operating in Jefferson county, Mo.

GEO. MITCHELL, general manager Greene Con. M. Co., Cananea, Mexico, is in Washington, D. C.

CYRUS O. BAKER JR. of the platinum refining firm of Baker & Co. has gone to Europe for sixty days.

PREST. SCALLON of the Anaconda Copper M. Co. has returned from Bozeman, Montana, to Anaconda.

ARTHUR KENNELLY has been appointed to the chair of Electrical Science in Harvard University.

DUNCAN MCVICHIE, general manager Bingham Con., has returned to Salt Lake City from Denver, Colo.

C. H. MCCORNICK of Salt Lake City, Utah, has gone to Paris to close a Kingman, Ariz., mining deal.

M. W. MATHER, manager Crœsus G. M. Co., Sierra county, Cal., has returned there from San Francisco.

W. G. RICE has resigned as Supt. W. S. Stratton's properties, at Cripple Creek, Colo., and will go to Denver.

J. M. HYDE, field assistant of the State Mining Bureau, is in Kern county, Cal., gathering a mineral exhibit.

WM. SCHOPPE has gone from Salt Lake City, Utah, to the mining office of A. W. McCune, Lima, Peru.

J. F. BURSLEM is general manager Boston & Mexican P. M. Co., Cumaripa, Alamos district, Sonora, Mexico.

T. H. TRACY has gone from El Paso to La Cananea as consulting engineer for the Cananea Consolidated Copper Co.

FORMER MANAGER SHIPMAN of the Independence mine at Cripple Creek is manager Camp Bird, Ouray, Colo.

A. T. CORBUS, secretary and treasurer Alaska-Treadwell G. M. Co., has returned to San Francisco from Ono, Shasta county, Cal.

L. A. SMITH, Victor, Colo., is now manager the Highland Mary mine, near Silverton, Colo., vice Thos. Annear, resigned.

L. L. MITCHELL, manager Standard Bank of South Africa, has been appointed director De Beers Consolidated Mines, South Africa.

J. F. PARKS, Supt. Kennedy mine, has returned to Amador county, Cal., after an extended reconnoissance through Montana and Colorado.

FRED S. JOHNSON has been appointed general manager of the interests of W. S. Stratton throughout the Cripple Creek, Colo., district.

ALEJANDRO LOUBET, general manager Fundicion de Sinaloa of Mazatlan, Mex., has resigned to incorporate a foundry and machine works in Mexico.

CHARLES HURLBURT, manager director Republic M. Co., British Columbia, has gone to the mine, where he will remain, superintending operations.

MANAGER J. E. BAMBERGER of the Daly-West, Utah, may abandon his trip to Europe and return to take part in the closing of the option on the DeLamar, Nev., mines.

C. W. TAYLOR has resigned the superintendency of the Empora M. Co., Magdalena, Mexico, to return to his assay business at Nogales, Arizona. He is succeeded by T. J. Morris.

ROBERT F. CARR, vice-president and manager Dearborn Drug & Chemical Co., Chicago, Ill., has returned to Chicago after a month's visit among the mining districts of the West.

M. C. GLASGOW has returned from Australia, where he went some months ago to look after some mining property for J. A. Butler, who discovered the Tonopah district, Nevada.

CHAS. H. MOYER, Lead City, South Dakota, is elected president Western Federation of Miners; E. Hughes, Butte, Montana, vice-president; W. D. Haywood, Silver City, Idaho, secretary-treasurer.

R. A. TREVARTHEN, late Supt. Portland G. M. Co., Cripple Creek, Colo, is sojourning in California for his health. D. C. Gabrin has been appointed Supt. Portland G. M. Co., to succeed Mr. Trevarthen.

Commercial Paragraphs.

THE Cleveland Pneumatic Tool Co., 74 Frankfort St., Cleveland, O., has appointed the Compressed Air Machinery Co., San Francisco, Cal., to represent it on the Pacific coast.

THE sales of the Overstrom diagonal concentrating tables, manufactured by the American Engineering Works, Chicago, Ill., are reported large. The manufacturers say the table gives satisfaction and is in demand.

THE Raymond Bros. Impact Pulverizer Co. of Chicago, Ill., have a building corner Laflin and Harrison Sts., Chicago, where they will, commencing July 1, manufacture their pulverizers and other machinery. The factory will be fitted with the latest machinery for manufacturing, and will be extensive enough to take care of this firm's large business—mainly the manufacture of pulverizers for mining and other purposes.

Catalogues Received.

The first catalogue of the Standard Diamond Drill Co. is received; 84 pages replete with illustrated description of these mining appliances. The statement is made: "They remove solid cores through rock for prospecting," and the several styles of drills are described in detail. There is also an interesting chapter on diamond drill boring tools. A request to 1644 Monadnock Blk., Chicago, Ill., will bring the handsome booklet.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING JUNE 3, 1902.

701,281.—STARTING MECHANISM—G. M. Brous, Houlton, Or.

701,547.—WELL BORER—J. T. Davis, S. F.

701,555.—FRUIT ELEVATOR—W. M. Ewing, Fresno, Cal.

701,318.—ARTIFICIAL LIMB—I. R. & W. D. Fenner, S. F.

701,710.—FILING SAWS—J. H. L. & G. A. W. Folkers, Oakland, Cal.

701,703.—HOSE COUPLING—C. Frankish, Ontario, Cal.

701,335.—BUNG AND FAUCET—L. H. Handy, S. F.

701,483—FIRE ESCAPE—R. B. Hemming, Oakland, Cal.

701,571.—SHIFTING TOPSAIL—A. Keegan, S. F.

701,589.—CAN HEADING MACHINE—A. W. Livingston, Alameda, Cal.

701,503.—BLOCK SCRAPER—B. I. Plummer, Grants Pass, Or.

701,614.—VEHICLE STORM APRON—W. G. Reese, Oakland, Cal.

701,632.—COFFEE FILTER—A. F. Shriver, Arbuckle, Cal.

701,518.—FEED WATER HEATER—F. W. Shupert, Spokane, Wash.

701,432.—EGG BEATER—E. L. Weed, Baker City, Or.

701,783.—TELEPHONE CALL—Williams, Ingram & Wilson, Walla Walla, Wash.

Latest Market Reports.

SAN FRANCISCO, June 13, 1902.

METALS.

SILVER.—Per oz., Troy: London, 23⅞d (standard ounce, 925 fine); New York, bar silver, 52⅝c, refined (1000 fine); San Francisco, 52⅛c; Mexican dollars, 44½c San Francisco, 42c New York.

COPPER. — New York: Standard, $11.75@12.00; Lake, 1 to 3 casks, $12.25; carload lots, $12.00; Electrolytic, 1 to 3 casks, $12.00; carload lots, $11.75; Casting, 1 to 3 casks, $12.25; carload lots, $11.25. San Francisco: $14.00. Mill copper plates, $17.00; bars, 18@24c. London: £54 7s 6d, spot, per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4⅛c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; plg, $4.75. London, £11 5s per ton.

SPELTER. — New York, $4.87; St. Louis, $4.50; London, £18 12s 6d per ton; San Francisco, ton lots, 5¼c; 100-lb lots, 5⅜c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN. — New York, plg, $30.50; San Francisco, ton lots, 31½c; 1000 lbs., 31⅝c; 500 lbs., 31⅞c; 200 lbs., 32c; less, 32½c; bar tin, ℔, 37½c.

PLATINUM.—San Francisco, crude, $17.50 ℔ oz.; New York, $19.50 per Troy oz.

QUICKSILVER. — New York, $48 00 large lots; London, £8 15s; San Francisco, local, $46.00 ℔ flask of 76½ lbs.; Denver, $50.50. Export, $43.50.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots. 20c; San Francisco, Plumbers', 100-lb. lots, 16½c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $21.00; gray forge, $20.75; San Francisco, bar, 2.75 ℔ lb.,3c in small quantities.

At New York yesterday the question of pig iron supply for the ensuing year was discussed by the operating chiefs of the various companies that form the United States Steel Corporation. Fully 90% of the pig iron used by the corporation is manufactured at its different plants, the balance coming from furnaces in the Shenango and Mahoning valleys, Pennsylvania. At these places the price is reported to have advanced from $19.75 to $21 per ton, which the corporation regards as excessive. About a month ago the Steel Corporation paid $16.50 a ton for a three months' supply.

STEEL.—Bessemer billets, Pittsburg, $36.00; open hearth billets, $36.50; San Francisco, bar, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per bbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19.50; extra sizes higher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19.00; shingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one toss 15½c. No. 1** 50%, carload lots, 11½c; led, than one ton, 13½c. No. 2, 40%, carloan lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11.75, long ton.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 29@30c ℔ lb.; carloads, 27@28c; in 10-lb. tins, 40c; sulphuric acid, in carboys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2½@3c ℔ lb.; blue vitriol, 5½@6½c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $1.90@2.00; flour sulphur, French, 2½@2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls. 8c; caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 75c; cs., 80c; raw, bbl., 73c; cs., 78c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 65c; cs, 70c; raw, bbl., 63c; cs, 68c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13½c; Mineral Seal, iron bbls, 19c; wooden bbls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 16c; do., cs., 21½c; 86° Gasoline, bulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14½c; do., in cs., 21c; Lard Oil, No. 1 bbl., 60c; cs., 65c; Neatsfoot Oil, bbl., 70c; cs., 75c; No. 1 bbl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb, 6¾c; 1 ton and less than 5 tons, per lb, 7c; 500 lbs. and less than 1 ton, per lb, 7¼c; less than 500 lbs., per lb, 7½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¾c; do. in kegs, 7¼c.

RED LEAD AND LITHARGE —One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7½c.

ASSAY LITHARGE.—Per lb, 9c.

BISMUTH.—Subnitrate, per lb., $1.60.

BONE ASH.—3c ℔ lb.

BORAX.—Crystal, 7c: calcined, 20c.

CHROMIUM.—(90% and over) per lb, $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2¼ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00

URANIUM.—Oxide, ℔ lb., $3.50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

WANTED.

Wanted to Bond a Dry Placer Claim, One Rich in Flour Gold.

Must be a dry proposition. Address "Placer Claim," care this office.

WANTED, for a developed mine in California, a competent mining engineer to look after development and exploration. Must be a full graduate of a recognized mining college and have had several years' practical experience in large iron, coal or copper mines, and be fully skilled in the engineering problems pertaining to extraction, haulage, ventilation, etc. Give full particulars of career, experience, age, etc., to "Vulcan," care of this paper.

WANTED.

Consulting Mining Engineer,

familiar with making examinations of mines, prospects and mineral lands. Address stating experience and references. Moderate salary to start, with advancement to competent man. Position permanent if found satisfactory. Address A., care of Mining and Scientific Press.

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SITUATIONS WANTED.

A young man with some experience at mines; course in both surveying and assaying, wishes position as assistant at some good mine. Good references. Address S. M. W., 401 Ellis, San Francisco.

PRACTICAL MILLMAN — AMALGAMATOR, Cyanide Man and Assayer, wishes position. School of Mines graduate. Best references. Address R. B., care of Mining and Scientific Press.

WANTED.—Position by experienced Electrician and Engineer. Repairing, armature winding, construction work, air machinery, general mechanics, etc. Familiar with mining and milling machinery. At present chief engineer References. Address "Electrician," care Mining and Scientific Press.

A SOBER AND INDUSTRIOUS MACHINIST and Engineer wishes employment as pumping or hoisting engineer, or anything of the kind Is also a fairly good electrician and a good pipe fitter, and thoroughly understands repairing of machinery of all descriptions. Can give reference as to ability. Address W. M., 43 Sixth Street, San Francisco, Cal.

WANTED.—Position as Assayer and Bookkeeper in a mine; experienced in underground work; good references; present position not desirable. Address Box No. 127, care of this office.

PHYSICIAN AND SURGEON with three years' experience in both emergency and general hospitals, in addition to experience in mines and private practice, wishes position in a mine. Best of references. Address Box 126, care of this office.

CHEMIST AND ASSAYER, WITH TWENTY years' experience in mill and smelter work. Can run sams. Address A. C., care of Mining and Scientific Press

THUNDER MOUNTAIN.—A successful superintendent of over 15 years' experience and acquainted with this district desires to take charge of property there for a good company. Address T. M., care of Mining and Scientific Press.

MINING ENGINEER, practical miner and mill man, assayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best references. Now working in southern California. Address A. M. P., care of Mining and Scientific Press.

WANTED.—SITUATION AFTER MARCH 15, 1902, as Manager or Superintendant of mines. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work. Four years' experience as manager and superintendent. Treatment of low grade ores a specialty. Practical in every detail. State location of mine and salary. Best of references. Address X. Y. Z., this office

A technically educated Mining Engineer, at present employed as superintendent of mines for one of the largest corporations in Mexico, desires a change of position to the United States about July 1st. Has had 18 years' successful experience as engineer and superintendent, never having made a failure; 36 years of age; strictly temperate; a skilled designer, geologist and metallurgist, and a practical miner, as well as a hard worker and thorough business man. References of the highest order, including present employers. Address Supt., care this office.

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Branch Office: P. O. Box 594, Salmon City, Idaho.

EXAMINATION OR SUPERVISION of Mines, Smelters and Mills.

Mining Engineer and Metallurgist, of unquestionable reputation and long experience, now permanently residing at Seattle, Wash., will examine or take general supervision of mines, smelters or mills, in Pacific Coast States, British Columbia or Alaska, as consulting engineer, for reliable parties. Is also reliable accountant to examine. Box 813, Seattle.

THE CALIFORNIA DEBRIS COMMISSION, having received applications to mine by the hydraulic process from Sam Abtye, in the Secret Diggings Mine, near Laporte, Plumas County, Cal., to deposit tailings in worked-out pit draining into Clark or Slate Creek, and from P. J. Sheridan and E. N. Ekel, in the Lancha Plana mine, at Lancha Plana, Amador County, Cal., to deposit tailings in worked-out pit draining into Mokelumne River, gives notice that a meeting will be held at Room 96, Flood Building, San Francisco, Cal., on June 16, 1902, at 1:30 P. M.

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ASSESSMENT NOTICES.

REWARD GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Pine Grove, Amador County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 28th day of May, 1902, an assessment (No. 10) of two (2) cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, Room 56, No. 309 Montgomery street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 30th day of June, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 21st day of July, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

J. STADTFELD JR., Secretary.

Office—Room 56, No. 309 Montgomery street, San Francisco, California

NATIONAL CONS. MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Rich Gulch Shasta County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 2nd day of June, 1902, an assessment (No. 16) of five cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, 708 Mission street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 15th day of July, 1902, will be delinquent and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 18th day of August, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

GEO. W. FLEISSNER, Secretary.

Office—773 Mission street, San Francisco, California.

BEST AND BELCHER MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Virginia District, Storey County, Nevada.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 28th day of May, 1902, an assessment (No. 76) of fifteen (15) cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, Room 33, Nevada Block, No. 309 Montgomery street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 2nd day of July, 1902, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on WEDNESDAY, the 23d day of July, 1902, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

M. JAFFE, Secretary.

Office—Room 33, Nevada Block, No. 309 Montgomery street, San Francisco, California.

DELINQUENT SALE NOTICE.

SILVER KING MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Pioneer Mining District, Pinal County, Arizona Territory.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 24) levied on the 17th day of April, 1902, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
J. O'B. Gunn	3679	350	$3 50 00
Michael Levy	7352	100	100 00
Michael Levy	7354	100	100 00
F. Avery, Trustee	7415	100	100 00
New York Issue.			
James Entwistle	1010	100	100 00
James Entwistle	1011	100	100 00
James Entwistle	1012	100	100 00
James Entwistle	1013	100	100 00
James Entwistle	1014	100	100 00
Nathan May	1016	100	100 00
Nathan May	1017	100	100 00

And in accordance with law, and an order from the Board of Directors, made on the 17th day of April, 1902, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, No. 310 Pine street, Room 36, San Francisco, California, on TUESDAY, the 24th day of June, 1902, at the hour of 1 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of sale.

J. W. PEW, Secretary.

Office—No. 310 Pine street, Room 36, San Francisco, California.

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MINING AND SCIENTIFIC PRESS

Whole No. 2187.—VOLUME LXXXIV. Number 25. SAN FRANCISCO, CAL., SATURDAY, JUNE 21, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

At times of light load portions of the stream shoot out into the river without striking the buckets of the impulse wheels. No attempt is made to "control" the flow of water by the governing apparatus, and sometimes the stream reaches clear across the canyon.

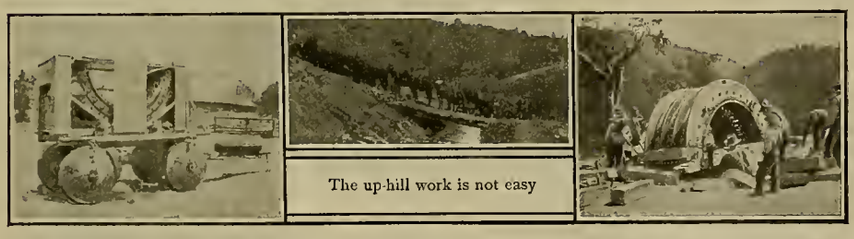
The interior of the Colgate Flume measures 8½ by 6 feet, and the grade is 9 feet to the mile.

This is an illustration of the construction of Lake Frances dam. The dirt, instead of being conveyed in the usual manner, was washed to its destination. A pipe, containing a line of perforations, located on falsework above the site of the dam, was made to receive a mixture of dirt and water and the latter allowed to ooze through the perforations until the filling-in was completed.

Construction Work. The end views are of work on a dam 210 feet high. That in the center illustrates hydraulic excavation for the Electra power house.

Supporting Insulators of the Great Carquinez Span. The Four Anchorages of the Span Cables. One of the Strain Insulators, each Housed Separately.

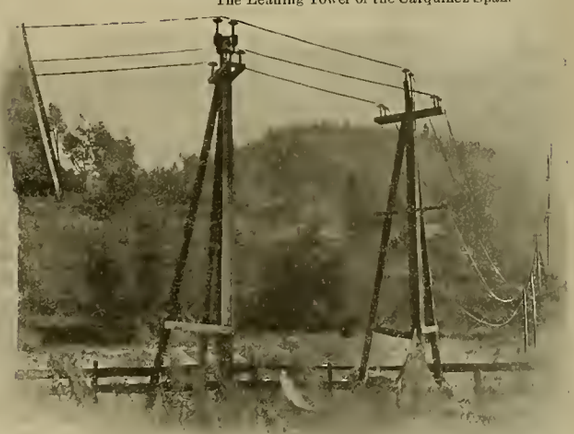
The Leaning Tower of the Carquinez Span.



The up-hill work is not easy

The end pictures represent respectively one of the mountain carts loaded with a section of armature, and the same armature in place to be snubbed down the power-house hill.

High Tension Line Construction. The center picture is of a Standard Company cable stringing cart.



An Angle in One of the High Tension Lines.

Scenes Along the Line of a Great California Electrical Power Company.—(See page 334.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

TELEPHONE, DAVIS 771.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union.....5 00

Entered at the San Francisco Postoffice as second-class mail matter.

Chicago Office (Telephone, Harrison 73).....737 Monadnock Block.
Denver Office (Telephone, Olive 733).....606 Mack Block.

J. F. HALLORAN.....Publisher.

San Francisco, June 21, 1902.

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LITIGATION has begun in Thunder Mountain, Idaho, district, which is the best evidence yet offered of mineral values therein. In any new mining camp, and many an old one, a strike is the immediate signal for a lawsuit, and the more valuable the find the more protracted and expensive the litigation.

FROM the Chicago Exposition of '93 was received by this paper a much appreciated award wherein its merits received due recognition, and now from the Paris Exposition of 1900 comes tardily but none the less appreciated the award of the U. S. Commission based upon the exhibition of this paper there. Both adorn the walls of the San Francisco office and are duly prized.

FROM the north come the usual June statements that "several thousand men are needed in Alaska this season," that "big wages are being paid," and "skilled miners are in great demand." Of course, this is not to be credited by any one looking for work. Miners wanting employment should not believe such stories, which are annually put out by water transportation companies.

REFERRING to the article on electric power plants on the Pacific coast, appearing on pages 334 and 335 of this issue, it is to be stated that an earth dam is now being built by the hydraulic process at Dobbins Creek, Cal., the level of which will be 382 feet above the main flume to the Colgate power house, in connection therewith. It is designed to thus create a reservoir impounding 93,500,000 cubic feet water.

IN this issue appears the fifth and concluding part of the article "Costs and Profits in Pyritic Smelting of Low Grade Copper Ores." It is a contribution to metallurgy that will form the base and groundwork of similar articles the world over for some years. Published in book form as a treatise on that subject, the article as it has appeared during the past five weeks would cost about $6. It is such original matter that gives this paper the prestige it enjoys among mining men everywhere.

THE season of possible fire destruction is at hand and the proverbial ounce of prevention is in order in every mining town. Many mining camps are built in a canyon where the natural suction causes a breeze that makes a big fire of a little one in short order. Carelessness is the cause of most fires and delay in immediate action often entails widespread ruin. It is good economy to have the fire extinguishing appliances in camps, mines and mills in such shape as to admit of immediate and effective use. Many a time in case of fire the first five minutes is worth $25,000 a minute.

Smelting Charges.

A more than usual number of questions concerning smelter charges make timely some general reference to that subject with a few details.

Smelter charges are not designed to be exorbitant or prohibitive. Smelter managers are good business men and understand that they could not long afford to drive away custom. Conversely they figure on a profit; and irrespective of assays other than their own (which are ordinarily rigid and exact), they have certain fixed charges and formulæ for computing them that enter largely into the important question of net returns to the producer. Looking at the matter from an independent standpoint, it may be noted in the case of an ore, for instance, assaying 10% copper, 40 ounces silver, 4 ounces gold per ton, that, though assaying a gross metal value of $50 per ton, it might not net $5 per ton to the producer after all just and necessary charges had been paid.

Leaving out of the question monopoly or combination or the trust feature (which has been fully and freely treated in these columns), there are certain set charges that every smelter makes; and while local conditions govern the question of profit or loss to the producer according to the locality and value of the ore, yet these charges are as much a part of the expense as candles or powder or wages.

In the case of an ore assaying say 22% copper, 1.5 ounce silver and 1 ounce gold to the ton, the smelter would probably pay for the copper, dry assay (equaling wet assay less 1.3 unit), 75% of the value of the copper, current quotations for electrolytic cathodes less 4½ cents per pound; for the silver 90% New York quotations date of assay; for the gold, 95% assay gold value of ore, reckoning gold at $20 per ounce; for any lime in the ore, 5 cents per unit, if 10% or over. The charges for treatment f. o. b. would be $6 per ton, charging for all silica contained at 10 cents per unit.

This, it should be noted, is not designed as specific. It is illustrative and general. With some ores there would be a penalty, on others a premium; this depends largely upon the smelting qualities of the ore and the smelter's immediate requirements in that direction. There are also numerous modifications. It was stated above that 95% of the assay value of the gold in the sample of ore cited would be paid. It is to be noted that this is really a payment of 91.2% of the actual coinage value of the gold. Should the ore run as high as 2 ounces or over, there would be a higher payment by the smelter; where it assayed over 5 ounces to the ton, the smelter might pay 98% on the $20 an ounce valuation, which would be 94.84% of the coinage value of the gold. This would afford a profit margin in 5-ounce ore of $5.35 per ton as compared with a similar profit margin of $3.25 per ton on ore carrying 1.95 ounce per ton.

As to the copper deduction of 4½ cents per pound, that is one way of paying additional percentage. In some smelters there is no such deduction in that way, their practice being to pay for 70% of the copper as determined by wet assay. The 4½ cents charge is really for freight and refining charges incurred by the smelter.

It is to be noted that ordinarily smelting charges are based on neutral ores, where the percentages of silica and iron are nearly equal. Were the charge for a neutral ore $6 per ton, there would be in some cases a reduction of 10 cents for each unit per cent of iron in excess of silica, so that if the ore contained 10% more iron than silica, the charge would be $5 per ton. Where, as in the cases cited above, the charge for silica would be 10 cents per unit, this would greatly increase the smelter costs.

One California correspondent sends smelter assays showing that his ore averages 28% copper, 30 ounces silver and ¾ ounce gold to the ton, but says nothing as to the iron, silica, etc., therein, though, manifestly, it would be fair to assume that in such an ore the silica would be in excess of the iron, thus increasing the smelter charge. He mentions that he has over a 100-mile wagon haul at a cost of $15.50 per ton and a $15.25 railroad rate to the smelter, making a total freight charge of $30.75 per ton. It is manifest that, though the assays show an apparently profitable ore, yet when the freight and smelter charges are paid, in this instance there would be little, if any, left for the miner.

THE activity in mining brings out more than the usual number of mining schemes that have a flavor of misrepresentation. This paper rarely notices those things, as its readers are not of the gold brick buying class. To some of those people any reference in this paper is keenly sought. As one of them wrote to a local confederate: "If we can get the MINING AND SCIENTIFIC PRESS to pitch into us it would be a big ad." Some time ago editorial mention was made of a California mining scheme that was strongly condemned. Immediately those working it up issued a new prospectus with: "See what the MINING AND SCIENTIFIC PRESS says," in big type, preceding a garbled and false statement, purporting to be editorial notice, wherein we were represented as commending what we had condemned. Chicago leads St. Louis now in producing doubtful mining schemes, and even Boston is behind New York City in the misleading statements appearing in the advertising columns of the daily papers and some "mining journals" that ought to know better. One Chicago concern, "The United Investment Co.," 167 Dearborn St., announce that they own the Sun Dance stamp mill and mine, near Prescott, Ariz., and claim to be now producing eighty tons of ore per day. W. H. Hall, the foreman in charge at the mill, says the property is owned by J. H. Wilkerson of Chicago, who has nothing whatever to do with the United Investment Co., and that the mill has not dropped a stamp since February, 1901. The "Union Security Co.," 234 La Salle St., Chicago, issue a "prospectus" of the Feather River Mining Co., Plumas county, Cal., and among the list of officers and directors is "Ell Torrance, commander-in-chief G. A. R., Minneapolis, Minn." Gen. Torrance says that he never was a director, officer or stockholder in that concern, and knows nothing whatever about it. Another "mining company" has large space in New York and Boston dailies, portraying what purports to be a map of the Dewey mine at Thunder Mountain, Idaho, and offering to sell treasury stock therein at 50 cents per share. That stock was long since taken off the market. There is none for sale. Of course, there is no law in those places reached by such advertisements against any one being a fool, though some people seem to abuse their privilege in that regard. Sometimes the federal government tries to protect those who silily seek to thus separate themselves from their money, and occasionally succeeds in securing a conviction, but, ordinarily, the game goes on unchecked. In the haste to take short cuts to wealth and the natural desire to share larger in the general prosperity, many who can poorly afford to lose the money are influenced to invest in "cheap" investment schemes in which the glitter of gold mining success is alluringly used. To warn such people would be a waste of space in such a journal as this.

FROM the northern part of California comes an item of a most suggestive nature. Redding is the natural metropolis of that splendid center of mining industry, but realizing this fact it neglected to take advantage of some of its opportunities till neighboring towns began cutting into its trade. The result is that Redding has waked up and is making superior inducements to create and maintain profitable business relations with outlying camps. The resultant good to the miner is considerable. California's greatest drawback is lack of good roads. Since competition began to get the miner's trade in northern California county boards of supervisors have spent large sums in opening and maintaining roads, subsidized stage lines have been established, and some regular organized effort made to bid in a business way for the miner's trade—a most desirable home market.

CANADIAN MINING JOURNALS announce a department of mines and mining to be created by the Dominion government. This journal has been advocating such department in the United States government since 1865, but Congress is slow to act in anything wherein the miner is concerned. When mining men realize that they have votes to elect or defeat Congressmen they will have a department of mines and mining, and not till then. Whether in Canada or the United States, public opinion must make itself felt on such subjects before there can be satisfactory result.

Concentrates.

THE tin production of Bolivia in 1899 was 5240 tons; in 1900, 6814 tons. The 1901 figures are not available.

THE cars carrying ore from Butte to the Great Falls, Montana, smelters carry an average of 80,000 pounds each.

RUBBING the hard rubber surface with fine emery paper will form a matt surface that will take a pencil mark.

ANY incandescent electric light will burn under water at any depth if the wires and the lamp are protected from getting wet

WOOD COAL or coke is preferable to coal for tool work, as the ordinary coal used has sulphur in it, which is injurious to steel.

TIN SCRAP is treated electrically or chemically for the recovery of the tin. One ton of scraps will yield fifty-five pounds block tin.

AN ALIEN may act as an agent for a citizen in the transfer of a mining claim or other property which he might not be qualified himself to hold.

WITH gas at $1.35 per 1000 cubic feet, the cost per horse power hour of a 4 H. P. gas engine would be $0.04; of a 10 H. P. engine, $0.037; 30 H. P., $0.035.

IN "Concentrates" for May 10, in the formula given for the amount of water discharged per minute from a nozzle, should have read: discharge $= d^2 \times .7854 \times v \times 60$.

ALL real "Babbitt metal" contains copper. To add more put it in the form of filings in the bottom of the crucible, put the Babbitt on top, cover with common soda; melt and stir.

ICE cools twice as readily as water. It forms at 32° F., but once formed is just like any other solid, and can be at a temperature of 40° F. below zero in an atmosphere of that temperature.

A CANDLE POWER is considered to be the light produced by a standard candle, six to the pound, burning 120 grams spermaceti wax per hour, candle 8¾ inches long, 0.85 inch diameter.

IRON is incandescent at 713° F., gold gives out light at 783° F., an electric light carbon at 734° F. Chalk can be made to glow and give out light by an oxyhydrogen jet, as lime does in a calcium light.

THERE are a good many excellent welding compounds for steel welding, but pure pulverized borax is probably as good as any. The main thing in steel welding is to keep the parts clean from dirt.

ANYONE legally locating a mining claim on public land and complying with all legal requirements in connection therewith has just claim on that portion of any dump that may encroach therein, and can enjoin such encroachment if prejudicial to his interests.

THE pressure exerted by a column of water one foot high is 0.434 pound per square inch, at a temperature of 62° F. Of course, this pressure increases directly with the height of the column of water, 10-foot head giving a pressure of 4 34 pounds per square inch, 20-foot 8.68, and so on.

GOOD TOOL STEEL, under a white heat, will fall to pieces; bright red heat will crumble under the hammer; middling heat, or cherry red, may be drawn to a needle point. Nitro muriatic acid (aqua regia) applied to the surface of steel makes a black spot; to iron, the surface remains clean.

THE velocity of steam escaping from a nozzle shaped to give best results depends of course upon the pressure above the atmosphere, as indicated on the steam gauge. At one pound pressure the velocity is 540 feet per second; ten pounds, 1230 feet; fifty pounds, 1740 feet, and at one hundred pounds, 1880 feet.

IN Salvador the mineral deposits include gold, silver, copper, lead and iron ores and coal, and occur chiefly on the slopes of the mountains which traverse Honduras and Nicaragua. The department of Mosazan is the richest. It includes ninety mines, half those in the republic, of which eighty-four produce precious metals.

THE quantity of electric current (amperes) that will fuse copper wire depends upon the area of cross-section, the length of the wire, and the temperature of the location. No. 18 (B. & S.) copper wire 5 inches long will fuse with a current of eighty-four amperes; temperature of location about 70° F. No. 20 wire requires fifty-six amperes.

AIR expands by heat in the ratio of the absolute temperature. The absolute temperature below zero, F., is 460°, to which add the higher temperature and divide by the initial temperature, plus 460°. The absolute temperature of 50° is 510°; and if the air be heated to 200° the absolute temperature will be 660°, and 660 divided by 510 equals 1.294, the new volume.

ACETYLENE GAS is low in heating power, and is not applicable to explosion motors. It has been discovered that by passing the gas through petrol it becomes heavily carbureted. As a heating agent this carbureted gas contains 33% more heat units than the ordinary acetylene gas. It seems probable that this discovery may make possible its practical application to gas motors.

THE most effective antidote for cyanide poisoning is peroxide of hydrogen, taken internally, or better, administered with hypodermic syringe. Such should always be kept in readiness in cyanide mills. This may be advantageously accompanied by pouring cold water on the head and spine and applying mustard plasters on the feet. Keep patient awake. Permanganate of potash is a fair substitute for peroxide of hydrogen.

HOW far a man can see with unaided vision depends upon several conditions—the clearness of vision in the individual, the density of atmosphere, size of object and illumination. Under proper conditions, an object 1 foot above a level stretch can be distinguished 1¼ mile; one 10 feet high, 4¼ miles; 100 feet high, 13 miles; mountains 5000 feet high can be seen 95 to 100 miles. Five miles may be taken as the limit at which a man can be seen by an observer on the same level.

ELECTRO-CHEMICAL reactions depend upon the fact that the salts of metals are dissociated when in solution. When potassium chloride is dissolved in water what actually exists in the water is a succession of free atoms of chlorine and potassium with great electrical charges. Similarly when silver or gold cyanide is dissolved in potassium cyanide solution the atoms are free; the weaker the solution the more perfect such free condition. As soon as the atoms of gold or silver lose their charge of electricity (as they do when an electrical current is passed through), gold with its ordinary properties is at once produced and precipitates itself in the solid form.

UNDOUBTEDLY the Transvaal, S. A., mines will be taxed by the British Government as a necessary contribution to the expense of the war of which they were so largely the occasion. The Transvaal laws imposed a tax on prospectors' or diggers' licenses, varying from 2s. 6d. to £1 per claim per month, and a 5% tax on the net profit of working of mines except on certain forms of mining lease, when 10s. a morgen, or 2½% on the gross production was payable. Machinery paid 1½% on importation, and the mining industry of course contributed indirectly to the revenue under other heads of customs. It is probable that under the new conditions the taxes will not be greatly modified.

WHEN the fire assay of lead is rendered unreliable by the buttons being alloyed with copper, the following method has been successfully adopted: The lead ore or matte is treated with nitric acid and the solution diluted and filtered; precipitation is effected by sulphuric acid, throwing down $PbSO_4$, BaS_4O, $SrSO_4$ and $CaSO_4$. The precipitate is washed down to the point of the filter with water to which a drop or two of sulphuric acid is added, and then dried. The dry precipitate is placed in a small annealing cup of clay and the filter ignited. The ashes are added to the precipitate in the cup. Cyanide of potassium equal to about five times the weight of the precipitate is then added; a larger quantity will do no harm. The whole of the contents of the cup are fused at a gentle heat over a spirit lamp. The lead sulphate in a few minutes is reduced to metallic lead (C. P.), which settles in the bottom of the cup. The cup is allowed to cool, and then, with contents, is placed in a porcelain dish with water. The cyanides readily dissolve, leaving the metallic lead, which is dried and weighed.

BY "absolute zero" is meant the lowest temperature compatible with heat—that point of temperature, in fact, at which a body would be wholly deprived of heat and at which the particles whose motion constitutes heat would be at rest. The temperature is supposed to be about 274° C., or 461° F. The term "heat" is here used in its scientific sense; as the word is ordinarily used its significance depends on the temperature of the human body. Men call "warm" everything with a temperature higher than their own, and "cold" all those objects which have less heat than they. In reality, however, the coldest body known to man is far from being utterly without heat. Ice, for example, has heat, only in a degree so much below man's temperature that one can scarcely imagine it to be anything but "cold," a term which actually implies a comparatively low degree of heat. Accordingly, the zero of thermometers is only a conventional point marking a certain degree of heat. There seems to be a point, however, where heat ceases absolutely, and this point is known in chemistry as "absolute zero."

THERE never was a time when the hydraulic mines of California could not be legally worked. The California Supreme Court has held in express terms that "the business of hydraulic mining is not, in itself, unlawful or necessarily injurious to others." It is only when the business is so conducted as to cause injury to public or private rights that the law interposes objection. Even the Sawyer decision in the North Bloomfield case recognized this principle, and the injunction issued in that case was left subject to modification or dissolution, according as facilities were provided for restraining the debris resulting from the mining operations of the defendant. The same court afterward approved the works constructed by the North Bloomfield Co., and permitted it to resume its mining operations by the hydraulic process. This occurred prior to the passage of the Caminetti act. There were many small mines in the higher altitudes, where the mining seasons are short, and where the debris was easily and successfully impounded, that were lawfully operated without molestation from any source. The great bulk of the hydraulic mines, however, came under the bans of the Anti-Debris Association, which secured the issuance of many injunctions by the courts at Marysville and Sacramento. These injunctions were not issued on the ground that the business of hydraulic mining was unlawful or criminal in its character, but on the sole ground that the particular mines enjoined were being so operated as to cause material injury to other interests. The Caminetti act, however, provides for criminal proceedings in addition to the civil remedies already allowed by law, and this feature of that act caused the owners of the small mines above referred to to shut their mines down until they could bring themselves within the provisions of the Caminetti act, which most of them did. There was an attempt made in the Legislature of 1887 to invest hydraulic mining with a criminal character, but the attempt failed and was not renewed prior to the passage of the Caminetti act.

FOR several years between 1865 and 1876 one could exchange a $20 gold piece at a broker's for $20 50, and sometimes for $21, or even more in silver half dollars or quarters, because silver change was more abundant than gold coin. If one wished to buy $20 gold pieces from a broker, he was charged something more. This was when greenbacks were below par and when banks kept their accounts in three columns—one each for gold, silver and currency. At one time, if one person had a check on a bank for $100 in gold, if he was willing to take silver for it, he could get $110 in halves or quarters. The Mexican dollar was in great demand then for shipment to China, and was worth over a dollar. The trade dollar was coined to take its place, but although it contained more silver, it was not a legal tender and would never pass for as much as the Mexican dollar. Now the Mexican dollar, containing more silver than the American silver dollar, is worth in this country 45 cents. There was also a time in 1879, after specie payment was resumed and greenbacks were worth their face, that silver was so scarce or so much needed for change that it commanded a premium of 1% to 2% in some coast cities. "Concentrates" has paid 25 cents for change for a $20 gold piece; that is, received back $19.75 in silver.

IN general, ore deposits represent a process of concentration of mineral matter either by chemical or physical means—that is, they are unusual localizations of certain minerals which are often found disseminated in smaller quantities in many common rocks, and they differ from the same minerals situated in other conditions only in their degree of concentration. There is a superficial alteration of nearly all ore deposits. The typical unaltered condition of gold in nature is in association with iron pyrites in quartz, and the effect of surface oxidation on such a deposit is first to convert the iron pyrites into hydrated oxidized iron minerals, which permeate the quartz, turning it into a rusty brown mass. The next stage is the gradual leaching out of the iron minerals by the action of surface waters, while the gold which was originally in the iron pyrites mostly remains, though it may have been partially dissolved in one or more several ways. Sometimes gold occurs in the form of telluride instead of iron sulphite, and in such cases superficial oxidation causes the tellurium to be oxidized and the gold to be set free from its combined state. When such deposits as those described are eroded the particles of gold separate from the quartz and are concentrated in the streams as placer gold.

SHOT FIRING by electricity has been employed with success for many years, and is now general. Electricity is employed to generate sufficient heat within the charge to start combustion, taking the place of the squib and safety fuse. Two kinds of electric fuses are employed, known as high and low tension, though this is hardly a proper scientific distinction. In the so-called high tension fuse the heat is furnished in the form of a spark, which passes between the ends of two copper wires, embedded in a detonating mixture. In the low tension form the heat is generated in a small loop of platinum, also embedded in a detonating mixture. The current for the high tension fuse is generated by a small magneto-electric machine, which is carried by hand into the mine, and connected to the wires leading from the fuses, at any convenient point, at a safe distance from the shots that are being fired. The current for the low tension fuses may be generated by means of a magneto machine similar to that used for high tension fuses, but having its coils wound for a lower pressure and a larger current, or by means of a small battery of dry cells carried in a box that can be carried in the hand or slung over the shoulder. They may also be fired from a stationary battery or large cells, placed in any convenient position, so that leads can be taken from it to any position at which it is required to fire shots. With the great improvement that has taken place in the manufacture of dry cells during recent years, the portable battery is becoming more generally used. While the high tension fuse requires a comparatively high pressure to fire, it only requires a very small current; while, on the other hand, the low tension fuses require only a very low pressure, but a comparatively high current strength. Neither the pressure of the high tension fuse, nor the current of the low tension fuse run into anything more than trifling figures, but they are "high" in each case for portable apparatus. High tension fuses have been generally used till recently; low tension fuses are now taking their share of the work, principally since the improvement of the dry cell. In the early high tension fuses there was considerable difficulty experienced owing to the uncertainty of the pressure at which the fuse would fire. This appears to be due to there being at that time no means of accurately measuring the distance between the ends of the copper wires, and of making them all to one standard gauge. The distance is a small one necessarily, and special tools were required to ensure accurate setting. The difficulties have been overcome, as so many other difficulties have been overcome, by improved methods of and greater care in measurement.

Costs and Profits in Pyritic Smelting of Low-Grade Copper Ores.

NUMBER VII—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by F. H. PRENTISS, E. M.

Diagram No. 14 is designed to show the fuel and flux value of the iron and sulphur that are carried into the matte, these values being based on coke at $15 per ton and limestone at $2.50 per ton as heretofore. A 25% matte, for example, from a 6% copper ore (marked X) would carry a value amounting to $1.29 per ton of ore, being equivalent to 25.6 tons of limestone and 4.33 tons of coke per 100 tons of ore. A 50% matte from the same ore (marked y) would carry a flux and fuel value of only 39 cents. With coke and limestone at prices given the difference between making a 25% and a 50% matte amounts to ¾ of a cent per pound of copper, no matter what percentage the ore contains, and similarly for other variations in the matte. The difference in cost for freight and treatment is obviously an item of still greater importance. Although $15 per ton for coke is a fairly high price, there are many localities remote from railway service and coke fields where the cost is much higher. At $45 per ton, for example, the same diagram gives results as follows: Point X shows 4.33 tons of coke, which at $30 extra cost adds $1.30 per ton, making a total of $2.59 for a 25% matte. Point y shows 1.50 tons, which at $30 additional adds $0.45, making $0.84 per ton, or a difference of $1.75 per ton of ore instead of $0.75, as due to increased cost of coke.

It will frequently he found easy to utilize the diagrams heretofore given in a similar manner for any differences in the cost of coke or limestone—or for the direct smelting of a siliceous ore the curves a b and c d of diagram No. 9 and the line c i of diagram No. 5 can he reconstructed to suit local costs and conditions, while the line a e, altered to suit conditions of cost, etc., may he applied to concentrating effects.

While the heating value of one pound of carhon if hurned to CO_2 is definitely fixed at 14,500 B. t. u., the heating value of one pound of FeS_2 due to the reactions through which it passes in the furnace is not so readily determined. In the first place it requires some expenditure of heat to drive off the volatile atom of sulphur, hut as this takes place in the upper part of the furnace we may disregard this expenditure just as we do any henefit from the volatile atom as fuel. The burning of the remaining sulphur to SO_2 produces 1010 B. t. u. per pound of FeS_2. The hurning of the iron to FeO yields 1134 B. t. u. per pound of FeS_2, a total of 2144. From this sum must be suhtracted the heat ahsorbed by the dissociation of the FeS, which amounts to 340 B. t. u. per pound of FeS_2, and finally there must he added the heat due to the formation of $FeOSiO_2$, which will vary with the composition of the slag.

Nor is this all, since still another addition must he made which is usually lost sight of. The ahove heat determinations are based upon the conditions that the elements involved, as, for example, sulphur and oxygen shall have an initial temperature of 62° Fahr. Now the coke and the iron sulphide are gradually heated as they descend in the smelting furnace hy the escaping gases until a temperature is reached where oxidation begins. Let us suppose them to he heated an average of 1200°. One pound of FeS_2 would have yielded .75 pound FeS, and allowing the specific heat as .22, the amount contained hy the FeS would be 200 B. t. u., thus adding 10% to the calculated heat value. Allowing the coke to carry 90% carbon and to have a specific heat of .42, the gain would he 500 B. t. u., which, however, would only he an addition of 3 8% owing to the greater heat developed per pound of coke than per pound of FeS. A pound of coke having 90% carbon which is burned completely to CO_2 yields 13,000 B. t. u. One-sixth of this amount would be 2167 B. t. u., which fairly represents the heat value of one pound of FeS_2. With poorer coke or with coke imperfectly consumed the ratio might become one-fifth, hut prohahly not greater, since to utilize the Fe and S the atmosphere of the furnace must be oxidizing, which would prevent the formation of much carbonic oxide.

It is furthermore true that the oxygen necessary to hurn the iron and sulphur (only half the latter, as the volatile atom does not count) of one pound of iron pyrites (FeS_2) is exactly one-sixth of that required to completely burn one pound of coke carrying 90% carbon. Six tons of iron pyrites, therefore, may he taken as equivalent to a ton of coke of fair quality hoth as to heat produced and air required.

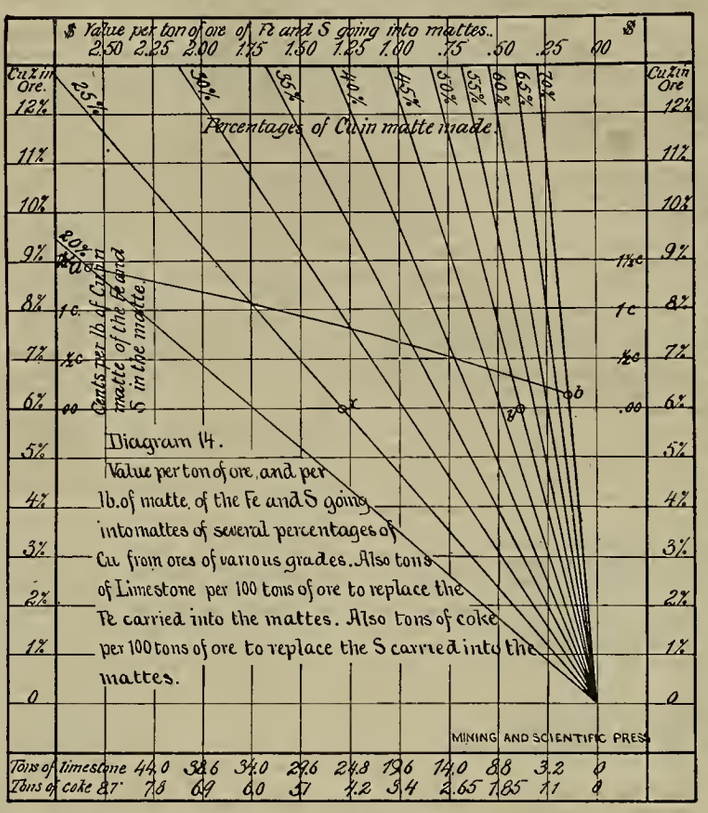
Suppose that we desire to smelt 100 tons of ore of type C, using the concentrates of 200 tons of type G ore as a partial flux and using a hlast heated 500° Fahr. above the temperature of the atmosphere, and making a slag having 40% silica.

Diagram 10 (point X) shows that 250 tons of type G must be concentrated to flux 100 tons of type C, and hence there will remain twenty tons of type C ore requiring limestone.

Diagram 6 gives for type C ore and a 40% SiO_2 slag 60% of limestone, and hence the remaining twenty tons of ore require 12% of limestone.

Diagram 3 shows for type C, with a 40% slag and hot blast, that there will be needed ten and one-half tons of coke, while diagram 2 shows for similar conditions under cold blast a requirement of nineteen and one-half tons, thus making for a blast of 500° F. a coke requirement of fifteen tons.

Column No. 22 shows one-fifth of type G ore to he availahle as concentrates for replacing coke and flux. We shall have, therefore, forty tons of FeS_2, which would (at a little better than one-sixth) replace seven tons of coke, thus cutting our coke down to eight tons. The actual weight of concentrates will include


$ Value per ton of ore of Fe and S going into mattes.
2.50 2.25 2.00 1.75 1.50 1.25 1.00 .75 .50 .25 .00 $
Cu in Ore.
12%
11%
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0
Percentages of Cu in matte made.
25%
30%
35%
40%
45%
50%
55%
60%
65%
70%
80%
Cents per lb. of Copper in matte of the Fe and S in the matte
Diagram 14.
Value per ton of ore and per lb. of matte of the Fe and S going into mattes of several percentages of Cu from ores of various grades. Also tons of Limestone per 100 tons of ore to replace the Fe carried into the mattes. Also tons of coke per 100 tons of ore to replace the S carried into the mattes.
MINING AND SCIENTIFIC PRESS
Tons of limestone 44.0 38.6 34.0 29.6 24.8 19.6 14.0 8.8 3.2 0
Tons of coke 8.7 7.8 6.9 6.0 5.1 4.2 3.4 2.65 1.85 1.1 0

the copper, iron and sulphur that go into the matte—twelve tons—and also five tons of lime as a hinder, and some slimes, say three tons, making in all sixty tons.

Diagram No. 4 shows for hot hlast 6800 cuhic feet of air are required per minute, and 10,500 cubic feet for cold hlast; hence for a temperature of 500° F. there will be required 8650 cuhic feet.

One hundred tons of type C ore carries 40% of FeS_2, or allowing 4% to go to the matte there remains 36% to be utilized as fuel and flux. The ore carries 42% SiO_2, and hence (for 40% slag) there will he made 105 tons of slag plus 8 tons from slimes and hinder lime, making 113 tons, and for resmelting foul slag and flue dust say total 125 tons. Quantities per minute are as follows:

Pounds of air	665
Pounds of coke	10
Pounds of charge	255
Pounds of FeS_2 (available as fuel)	105
Pounds of slag	175
Pounds of matte	25
Pounds of limestone	17

Allowing 2000 B. t. u. per pound of FeS_2 and 12,500 B. t. u. per pound of coke we find heat developed per minute to be:

By FeS_2	210,000 B. t. u.
By coke	125,000 "
By hot blast	78,800 "
Total	413,800 "
Allowing 1000 B. t. u. for sensible and latent heat of slag per pound we find the heat carried away per minute by the slag to be	175,000 B. t. u.
And similarly the matte	25,000 "
Escaping gases (600° F. above atmosphere), consisting of the blast with its added burden of sulphur and carbon	105,000 "
Allowing an average of 5% moisture for the entire charge	17,000 "
Allowing sixty gallons of jacket water per minute heated 120° Fahr.	57,600 "
Heat absorbed by dissociation of $CaCO_3$	11,220 "
	390,820 "

Agreeing substantially with the figures for heat generated as given above.

The percentage distribution of heat would he as follows:

Slag	44.90%
Matte	6.30%
Waste gases	26.90%
Moisture	4.50%
Jacket water	14.70%
Dissociation of $CaCO_3$	2.70%
	100.00%

These figures, though hased upon uncertain data and inexact constants, are sufficiently proximate to show in a general way the distribution of heat in the hypothetical case taken. A ton of coke per day yields 17,360 B. t. u. per minute. If the temperature of the waste gases had been assumed at 400° ahove that of the atmosphere, instead of 600°, the coke saving would have heen two tons daily, a reduction from 4% of coke to 3%. Had the twelve tons of limestone heen replaced by FeS_2 the heat value of the latter, together with the coke equivalent to the heat ahsorhed hy dissociation of the $CaCO_3$, would have saved 2.5 tons of coke, reducing the amount to 3.5 tons, or to less than 2%. On the other hand, a cold blast would have increased coke consumption 4.5 tons.

The amount of surplus air has much to do with coke economy. In hurning coal under a boiler the surplus air (that is the amount over and above the chemical requisite) varies under different conditions from 50% to 200%. In these calculations I have allowed 133%. The effect of the temperature and surplus air upon the amount of heat carried off hy the waste gases is easily seen.

In the present hypothetical case the heat of the slag is two and a quarter times greater than that required to heat the hlast, the heat of the waste gases one and a third times as much, and the jacket loss ahout 70% of the amount. Practical difficulties stand in the way of realizing a high temperature of hlast from these sources of heat, although some value is returnahle and a numher of devices are in use.

It may be roughly stated that for every hundred degrees increase in temperature of the hlast a saving of half a ton of coke per 100 tons of charge is effected and nearly 5% added to the smelting capacity of the furnace over that of cold hlast. In case, for instance, the blast should he heated 400° hy means of the slag or the waste gases, the increase in smelting capacity would he 20% and the saving in coke would be two tons for every 100 tons of charge.

It becomes a comparatively easy matter, therefore, to determine the value of a hot hlast appliance, whether the source of heat should he cheap fuel or waste heat from the furnace.

Copper Resources of California.

The most important and valuahle puhlication issued hy the California State Mining Bureau since its oil hulletin is Bulletin No. 23, devoted to the present state of the art regarding the copper resources of California, just issued hy Lewis E. Auhury, State Mineralogist. It is from the office of the California State Printer and is in every way a creditable production, worthy of the Mining Bureau, and up to the standard of its former puhlications, which is saying a good deal.

The volume contains 282 octavo pages and is superhly produced. The illustrations, sixty-nine in numher, are fine engravings from recent photos, the eight maps give clear idea of the subject, and the work is finely printed on heavy plated paper.

Credit is due State Mineralogist Aubury for the arrangement and treatment of the suhject. The condition of the industry and general copper statistics of the State precede some historic notes, followed by detailed description of the principal copper producing properties in the various counties. Shasta county is given sixty-six pages of geologic description, details of the several ores, the manner of mining and metallurgical treatment, and present condition and working of each copper mine and prospect in the county. Similar proportional notice is given the forty-three of the fifty-seven counties in California wherein copper is mined. There are also several fine views of some of the copper smelting works of the State, with a description of how they are operated.

The hulletin throughout evinces care in its preparation. It is not a mere compilation of old material, but shows intelligent and successful effort to have the information up-to-date. Only those who have tried this kind of work can fully appreciate the labor involved in such work.

A limited edition of this book is printed. It will he sent to any address upon receipt of 62 cents.

Electric Power Plants of the Pacific Coast.*

For the past twenty years in the history of electrical engineering there has not been a time during which remarkable work on the Pacific coast has not attracted attention. In San Francisco was one of the first lighting companies, and one of the very first attempts by a public lighting company to light a large city on a comprehensive plan. Power transmission at constant current was first used on the coast, where not only a 10,000-volt motor circuit was installed in San Francisco, but long-distance transmission was also actually performed in the mines with as much success as attended electrical machinery anywhere at the time, and the failure—as far as it was a failure—was due to the faults of design and manufacture of that day, while attempting problems which admitted no failure in their solution. Men's lives, as well as the financial success of such undertakings, depend on absolute continuity in mining operations. Later on long-distance single-phase alternating lighting was installed at Pomona, in southern California, and single-phase power transmission at Bodie.

Walla Walla, Wash., saw one of the first single-phase power transmission plants, and the plant at Redlands proved first the success of multiphase working. Nevada City first proved the commercial success of transmission to the mines and mine working.

The installation of the Folsom and Portland plants is not yet forgotten, and finally we have the remarkable installations at Snoqualmie Falls, Wash., the southern California 33,000-volt, 83-mile transmission, the Bay Counties, with 144-mile transmission, and the Standard Electric Co., part of whose 154 miles of transmission, being used in connection with the Bay Counties plant, enables that company to hold the magnificent record of an actual every day transmission of over 220 miles.

We then see that the notable work on the Pacific coast is not confined to the last few years or to any particular locality. From the north to the south plants are scattered which merit attention and study, particularly to many of us who are not familiar with any work at all similar.

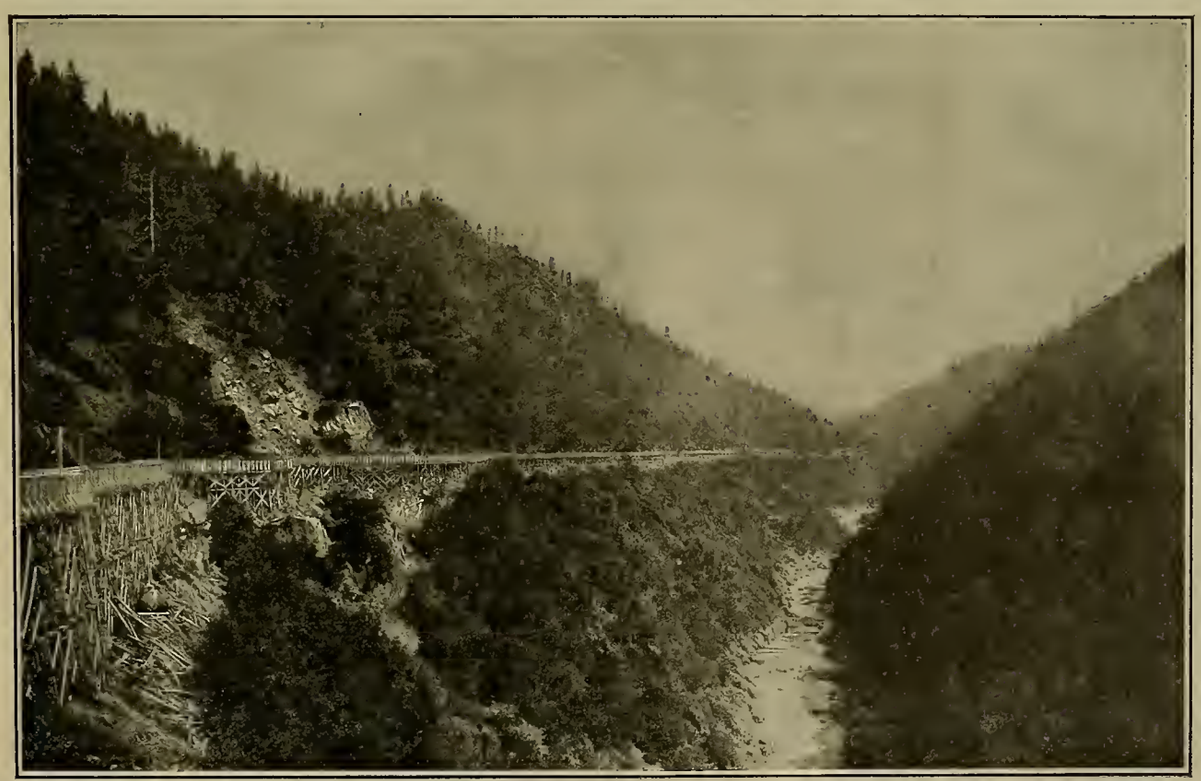
Among the plants themselves perhaps no one has attracted more attention or excited more discussion than the remarkable one at Snoqualmie Falls. Certainly no plant has a more remarkable or beautiful situation.

The lights of the town and wires of the lines are evident, but no power house, for here they have adopted the startling plan of excavating a cavern for the power house within the very rock over which the falls plunge. To reach it you enter a little cabin near the forebay and are lowered by an elevator down the shaft, which also accommodates the penstock, and 250 feet below the surface reach the machine room, where are located six 1500-kilowatt generators in a large whitewashed cavern cut out of the solid granite. The plant is located as it is for the reason that the spray from the falls would have made impracticable any power house at their foot, and to have gone farther down the river would have necessitated a location around a bend, to which a channel must have been cut at an expense probably greater than that for the present work. This plant disputes with the Standard Electric Co. of California the honor of being first to use aluminum for transmission lines. The lines were erected at about the same time, but those of the Standard Co. were the first to be put into service, and, being more carefully strung, were the more successful from the start.

Power is transmitted at 60 cycles to the cities of Seattle and Tacoma, where lights and railways are operated. In Seattle rotary transformers are used for the conversion, but in Tacoma motor-generator sets are employed and regulation obtained by a combination of synchronous and induction motors. Much of the complaint and criticism of this plant seem to have been due to the apparent fact that there is little harmony between the seller and the largest users of power, and both the large companies at Seattle and Tacoma are at present installing some steam in spite of the fact that at no other point on the coast is power sold at a lower rate, and that the difficulties with regulation and general service from the plant are largely chargeable to the atti-

*Condensed from a paper read by F. A. C. PERRINE before the New York Electrical Society.

From Colgate, Cal., to Oakland, where the Bay Counties line ends, is 152 miles. From Oakland to San Francisco by way of the Standard Co.'s line is 70 miles. The tying-in at Oakland gives, therefore, a transmission of 222 miles from Colgate to San Francisco. Power is taken backward, so to speak, from Mission San Jose over the Electra line as far as Stockton. Here energy aggregating several thousand horse power is distributed in every day, hard commercial service at a distance of 218 miles from its point of generation. "S. K. C." are the initials of the inventors of this type of electrical apparatus—W. Stanley, J. F. Kelly, C. C. Chesney.



Flume Along Yuba River, Cal. From "Point View" a Panorama of Nearly Four Miles in Length can be Seen.

tude of the users of the power themselves.

As we move southward into California the power plants begin to multiply, and connected with every one generally is something much of interest. Many have historical importance, though most have long ceased to attract particular attention. The traveler in the mountains finds, far away from any appearance of civilization, a well-kept canal, or ditch, as these pioneer engineers would call it, and following it for a few miles a low, constant, not unmusical note reaches his ear, and he knows that beneath his feet along the river banks lies one of those power plants, ceaselessly generating current to be used in the neighboring mines or the distant cities. Throughout the center of the State a constant type of plant prevails, and it will be of more interest to confine our attention to two most remarkable recent plants than to attempt to mention the many. The type of plant to which we refer is that of one supplied with water in a ditch varying from 5 to 50 miles in length, producing, by its combination of the rapids along the river, a head of from 300 to 1500 feet, which is utilized with impulse wheels running at a high speed and direct connected to generators. These feed step-up transformers and the high-voltage current are transmitted for use over distances of from 5 to 200 miles and more.

The two central California plants to which I wish particularly to direct attention at present are the plants of the Standard Electric Co. and the Bay Counties Power Co. Both of these plants are great and long-distance extensions of small undertakings, though the growth of the Standard Co.'s plant is the more notable and worthy of the greatest attention for the reason that this plant was more original in its conception and the more remarkable in the manner in which that conception has been carried out.

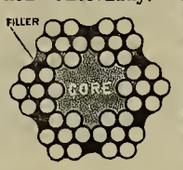
The Bay Counties Power Co. is a growth from two small plants within 30 miles of each other, situated in the Sierra Nevada mountains, the original of the two being the plant of the Nevada County Power Co., supplying Nevada City and its neighboring towns, which is really remarkable on account of the fact that it was one of the first—if not the very first—plants in California entirely successful as a financial undertaking, and one which from its original period of operation successfully carried out the difficult undertaking of supplying mines with power. The other part of the Bay Counties Power Co. was originally more moderate as an undertaking, but has grown to be the more important side of the business. This company was the Yuba Power Co., using a fall in one of the irrigating ditches and returning its tail water to the ditch for further distribution in irrigation. From these beginnings the Bay Counties Power Co. has grown by reaching out after business wherever it was offered and developing water powers wherever they were reasonably available for such purposes, and the success which attended the original elements of this company has been continued during its entire growth.

The Standard Electric Co. is not so much a growth as an achievement. Thirty years ago the Blue Lakes Water Co. was incorporated for the purpose of furnishing water to the mines in Amador county, and a ditch system considerably in excess of 80 miles in length was constructed. For many years the company was very prosperous, but with the change in mining through that section of the mother lode, and the partial suppression of hydraulic mining, the property became only reasonably profitable. While the company was in this condition Prince Andre Poniatowski came to California with the plan of taking up mining properties that had proven to be only partially successful, developing them, and so forming from many small and unprofitable mining concerns one large and prosperous. Incidental to this plan he joined the Blue Lakes Water Co. in building an electric plant on the Mokelumne river, where a head of 1000 feet was available, and distributing power to his mines with the idea of cheapening their cost of operation. A plant was installed and successfully operated, but as Prince Poniatowski became more familiar with power operations in California and the condition of mining on the mother lode he came to the conclusion that a great power plant could be formed, with the Blue Lakes Co. as a nucleus. Accordingly he purchased the Blue Lakes Co. and formed the Standard Electric Co. of California, which company announced its intention of transmitting power to the city of San Francisco, a distance then estimated at 110 miles. The plan was a bold one and has been boldly carried out, without at any time during the development of the scheme ideas less than practical being allowed to prevail in the councils of the company. Previous to the issuance of the specifications for the machinery the best engineers of the country were consulted in regard to the manner in which the work was to be done, and nothing incorporated in these specifications not then considered feasible by a number of the best engineers. Indeed, the boldest thing about this problem, namely, the operation at about 50,000 volts, was proposed by the Stanley Electric Manufacturing Co. of Pittsfield, Mass., as manufacturers, and the contract let to them on account of the saving they were willing to guarantee above the Standard Co.'s engineers' estimates, made possible by the increased voltages they would undertake to operate. This company has now been building its plant for about four years, and will continue to build without supplying power until it is satisfied that the work is done, and so thoroughly done that there can be no question as to the continuity of the service. In the first place, storage reservoirs in the high Sierras have been provided for an estimated storage of water amounting to 150 days—equal to the maximum dry period the records of the State can show are to be anticipated. These reservoirs, situated at elevations varying from 6000 to 8000 feet above sea level, in Alpine county, where there are only eighty inhabitants, exclusive of Indians, are provided with dams built in a most thorough manner and cared for most regularly. From these reservoirs the water is allowed to flow down 50 miles of the channel of the river to the diverting dam near West Point bridge, where it is taken out of the river and carried along in a ditch about 25 feet wide and 5 feet deep to the crest of a hill above the power plant, from which a wood stave pipe line 3000 feet long leads to where a sheer descent can be made to the power plant itself, which is supplied by a head of 1450 feet with a length of pipe of only about 3600 feet. It can readily be seen that the flow of water in 20 miles of ditch cannot be regulated to suit the variation in load likely to be experienced by the plant, and in order that the ditch may be used with a constant flow a reservoir is provided, into which any surplus of water that may be flowing above that demanded by the load can be retained until a peak load period is reached, when the surplus above the ditch capacity is supplied from the reservoir. With a hill so steep down which the pipe line is laid, it can be readily seen that no reservoir site is available between the plant and the ditch. Accordingly a bold plan is adopted of storing water in a valley across the mountain from the power house and leading the water back to the power house side of the mountain through a tunnel about 3000 feet in length.

(TO BE CONTINUED.)

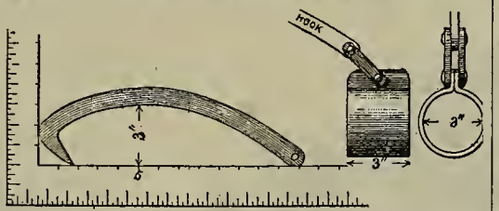
Preservation of Wire Ropes.

There are numerous places where wire ropes are liable to become water soaked where not specially prepared to resist moisture, such as cable railway service, wet mines, dredging machinery, power transmission, and in many other places of exposure. The wire ropes of elevators in offices, stores, warehouses and general buildings sometimes show an outside corrosive effect. Sometimes the interior of wire ropes reveals disintegrated cores and corroded wires, even where there may be little evidence of deterioration externally. The illustration herewith presented shows application of a special material known as "wire rope filler," by which the core is lubricated, and a flexible cushion interposed between it and the strands. The filler exuding between wires is said by the manufacturers to prevent abrasive wear, to seal against acid, gaseous, sulphurous or water attacks, and to form a foundation on which an outside coating should build. The manufacturers of this filler also make an outside coating termed "wire rope shield," for external protection against abrasive wear, designed to completely seal against exterior attacks, and a substantial increase of life is evident from the internal treatment and furthered by the external protection. The Ironsides Co. of Columbus, Ohio, manufactures these materials.



Rough and Ready Cant Hook.

To make a cant hook for rough use the accompanying sketch and description will enable one to be furnished of home manufacture: The hook is made of steel ⅜x1 inch, 15 inches long. A hole is punched in one end and a marl point is made on the other and bent to the inside of a square so that at 5 inches it is 3 inches from the square, and the marl point turns in 1¾ inches, as shown in the accompanying sketch. In the sketch is also shown the band, which is made 3 inches wide and as large as is wanted for the lever. A hole is punched in each end and the ends are brought together and riveted inside two straps, which are ⅜x⅝-inch iron. They are then heated and worked until they are loose so as to make a double hinge. This cant hook will do good work on any size log or square lumber.



Making a Cant Hook.

THE Geological Survey reports a coal production last year of 292,240,758 tons, value $348,813,831; in 1900 the output was 269,881,827 tons, worth $306,-891,364, an increase of 22,358,931 tons, or 8% in quantity and 13.6% in value.

Acid Plant at Black Warrior, Ariz.

Written for the MINING AND SCIENTIFIC PRESS by E. H. BENSON.

Much interest in the manufacture of sulphuric acid has been awakened among mining men from the fact that the process of leaching ores by sulphuric acid has recently acquired new prominence and interest. The process of extracting copper from its ores by leaching with acid, while not new, has acquired interest, owing to the practical manner in which the Black Warrior Copper Co., Amalgamated, of Arizona have taken up the process.

The manufacture of sulphuric acid from sulphide ores is not a difficult or complicated process, though the attention of a careful and experienced man is desirable in this as in other technical industries.

Briefly described, the process is as follows: Ore sufficiently rich in sulphur to support combustion, in roasting, takes up oxygen and liberates sulphur, which is converted into an oxide, SO_2. These fumes of sulphur dioxide are conducted through flues and niter oven to the Glover tower, through which they pass to the condensing chambers.

The sulphur dioxide requires further oxidation to SO_3. When this is accomplished, in the presence of moisture, H_2SO_4 (sulphuric acid) is formed, which liquid settles to the pan of the chamber and is drawn for use or run to platinum stills and distilled to oil vitriol, 66 Baume, specific gravity 1 835. The SO_2 is oxidized by action of nitrous gas obtained by boiling nitrate of soda with sulphuric acid in iron pots heated by the furnace gases. Nitrate of soda is converted into sulphate of soda and the nitrous fumes mingle with the sulphur fumes, oxidizing them to SO_3. The oxidized nitrous fumes take on oxygen from the excess of air drawn through the furnace and repeat the process until the chemical action is complete. The sulphur fumes being converted into H_2SO_4 in their passage from furnace to exit of chambers, the nitrous gas is drawn by the outlet draught through the Gay Lussac tower, which is packed with coke or other acid resisting material, over which cold acid of 1.700 specific gravity or higher is kept trickling, which acid has the property of absorbing the nitrous fumes. This acid is caught as it comes from the bottom of the tower, pumped to the top of Glover tower and run through the same over quartz packing, which is heated by the gases from the furnace, when it is denitrated by the action of sulphurous acid and heat. The nitrous gas passes again into the chambers to repeat its oxidizing action, and this process is repeated indefinitely. A small amount of nitrate of soda is used continuously to make good the losses of nitrous gas, some of which is absorbed by chamber acid and some of which escapes through the exit pipe. The hot, strong acid running from Glover tower is cooled and used for the Gay Lussac tower.

The lead chambers are supported on a special framework in the chamber building, lead of six or seven pounds weight per superficial foot being used. All joints and seams are burned together by the hydrogen blow pipe, making a solid lead joint. Towers are built after the same plan, heavy lead being used. The pan of Glover tower should not be less than forty pounds per square foot to resist the action of hot acid.

It is found in practice that the cubical contents of the chambers determine the amount of acid which is produced by the plant. Eighteen or twenty cubic feet of space for each pound of sulphur burned in twenty-four hours is considered good practice, though smaller space is used in some cases where chambers are supplemented by a condensing tower and a fan system. Steam enters the chambers through pipes placed at suitable intervals, which furnishes the H_2O and determines the strength of the acid produced.

For various reasons the acid produced in the chambers should be from 50° to 55° Baume hydrometer. Chambers are fitted with drips for catching a sample of the acid as it makes and runs through cups containing a hydrometer, which shows at a glance the strength of the acid being produced.

Thermometers give indications of the chemical action, and frequent determinations of the exit gas shows whether the proper amount of oxygen is supplied.

Every pound of sulphur burned should produce 4.75 pounds of acid of 50 Baume strength. This amount varies somewhat according to management of process and proper construction of plant.

Various styles of furnaces are in use, such furnace being determined by the character of ore used. For sulphide ore, concentrates or fines some of the automatic furnaces are desirable. The Black Warrior plant consists of four Herreshoff patent furnaces, each furnace having a capacity of 3000 pounds of sulphur burned per twenty-four hours. These furnaces are driven by a small engine, and requires little attention.

The ore is elevated by a belt elevator to the central hopper and distributed to furnace hoppers, where a small amount is fed to furnaces automatically at each revolution of shaft. Each furnace has five shelves over which the ore passes before reaching the discharge damper.

In practice the furnace is brought to a red heat

witb wood or otber fuel, and the sulpbide ores, which should contain at least 35% sulpbur, are tben cbarged into tbe furnace, no more fuel being used.

The cinder discharged from furnace is iron oxide carrying such values as were contained in the ore. Tbe values may be recovered by smelting in furnace or by leaching.

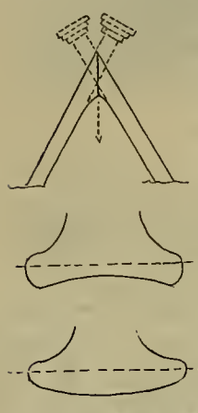
At Black Warrior the buildings are of tbe following dimensions: Cbamber building, 210x65 feet; posts, 35 feet; floor joist, 3x12 incbes, placed 18 inches to centers, resting on 10x12-inch timbers, with supporting posts 8 feet 4 inches to center; trusses, 14 feet 6 incbes to centers. Tbe building is built of best Oregon pine. Towers are built of 10x10-inch timbers surmounted by tank house. Lead chambers are tbree in number, of the following dimensions: No. 1, 200x25x20 feet; No. 2, 160x25x20 feet; No. 3, 35x25x20 feet; lead work of Glover tower, 10x10x24 feet; lead work of Gay Lussac tower, 9x7x40 feet. About 160 tons of lead were used in the construction of the plant, which is thoroughly up to date in all details.

Judging From the Surface.

Written for the MINING AND SCIENTIFIC PRESS by C. H. FITCH.

Continuing the subject of foundations, the point I make is that tbe plane of surface is the proper plane of jointure for the consideration of stresses, and that tbere is no logical nor good engineering reason for going an indeterminate deptb below the surface, making a stub end of heavy and expensive masonry tbere and building up from it.

Tbe point taken may be made more clear by a few sketcbes, which, though freely and rougbly drawn, will convey tbeir ideas as fully as tbough elaborate.



In tbe first figure I show an A frame subject to a load indicated by arrow head. Tbe sides of tbis frame abut against each other, and if they were of material liable to be crushed they might justifiably be widened at the point or place of junction, spreading the stress over more surface. But it would not be warrantable to extend these side frames and put "foundations" on them, as shown in broken lines, without any reference to load or plane of stress.

It may be argued that tbe common foundation is not so bad as this because it does spread slightly and give a larger bearing, and take a load. But it is not designed in reason to effect a clear purpose. It puts increased load on the eartb at a place where it is not as well drained nor as able to resist pressure as at the surface. It is a footing and in a clumsy way serves tbe purpose of a foot, but it is a submerged foot, where there is no more scientific need of it tban there is of a submerged tenth in sociology, and it is a needlessly heavy foot just as there is needlessly heavy weight in human government. Wben we lay out a walk we do not fill it with holes to put our feet in; but when we legislate for the moral walk we do, and wben we set a building on the ground, we make a hole for it. It is the cave and crypt habit.

A flat or blanket form is that of the surface, and it only requires to be given a thickness sufficient to distribute the pressure. Tbis tbickening may be given a convex or concave parachute form, as indicated by the sketches. Tbe surface is still the plane of stress. Tbe footing is a hardening of tbe ground to enable it to distribute and bear its load. I base judgment on the surface. I judge a man by bis face, and a lode by its outcrop. I do not place my hopes in depth and darkness. Tbere is much more to be said on this subject.

I have seen recently the plans proposed by a French architect for a monument to Progressive America, which it is designed to erect at Jackson Park, on tbe site of tbe Columbian Exposition. It is to be several times as higb as the Eiffel Tower, and to make all of earth's tall structures look lowly, and there is not an idea about it except mere bigness. This lack of idea reminds me of the difficulty Randolph Rogers had in making a "genius" for Connecticut. He wrote tbat be had read all the histories of Connecticut sent him, looking for his ideas, and could not find any in particular, so he made an angel with two wreaths and advised its adoption as the Genius of Connecticut. Tbe official commissioners had no ideas to the contrary. Wbat commissioner is ever surprised with an idea? Tbis 17-foot genius has a cousinly likeness to a genius on a fountain at Berlin, and migbt be appropriately styled our cousin German. At a distance it looks like a wild goose in flight. It was imported from Munich at a cost of $17,000 and crowns the lanthorne of a dome supported on granite columns, which broke badly under tbe weigbt which they had to bear, because the stones were not surfaced so as to have a proper bearing. Fifteen tons of type metal were run into tbe joints of these stones, to expand on cooling and bring tbe surfaces to bear.

It was a question of surface. The granite was amply strong. "To question its sufficiency," said General Franklin, "would be to cast doubt on all engineering calculations, and on all bigh structures. Tbe weakness was in tbe surfacing. From tbe crowning figure of tbis tower an adopted genius, if we follow the stresses down tbrough tbe crippled piers to the base, we find tbe structure excessively heavy, witb adopted ideas at every point. Below the surface we find a massive granite substructure—what I call the plug of a building—and under tbat the ground. Is not tbis going to large expense to be needlessly bard on the ground? If the ground bas got to stand it, why not put the substructure above ground, where sometbing can be seen for tbe money? This building is 250 feet high. Proceeding to greater beigbts—even to the gigantic monument proposed for Jackson Park—all are designed with the plug foundation.

I have often seen the foundations of Cbicago "sky-scrapers" going in, wooden piles supporting stones and grillages of iron beams. I have seen calculations of tbe stresses in such beams based on certain assumptions which were hardly demonstrable. But the stresses under the piles or in the ground between tbem I have never seen figured, even bypothetically.

If tbe ground be tender, if it bas not great bearing power, why do we put upon it sucb a prodigal weight of stone and beams? Wby do we not use tbe lightest and strongest steel, protected against corrosion and so disposed as to spread the load of heavy piers over a large area in the most complete, uniform and effective way? For a single pier this form would not be that of a bridge truss nor of a gridiron. We would not think it prudent to take to the air from a balloon depending upon a paracbute in any of these forms. It would be even for the highest and heaviest structures a balanced surface plate of requisite stiffness to distribute the load.

In a stamp mill foundation, or one under a steam hammer, we have to absorb the inertia of a live force and mass is required; but even then tbe plug form largest at depth and built up from depth like a pier on the surface has no special propriety. Better have the area and weight near the surface, wbere it will take up the inertia more quickly and effectively.

In short, foundations should be inverted—tbat is, planned from the surface, instead of from an indefinite point below the surface. The absence of rational grounds for the starting point of the present style of foundation is shown by tbe fact that there is no theory on the subject. In a few inches we pass abruptly from granite, with a crushing resistance of 8000 pounds per square inch, or iron, with a crushing resistance of 80,000 pounds per square inch, to eartb, witb a crushing resistance vastly less, perhaps 500 pounds per square inch, and behaving more like a fluid.

I started this consideration of foundations with roads. I concluded that the Telford idea was wrong. It appeared to be adopted from the building foundation idea. Tbis I conclude to be wrong also.

We build wrong and fancy we must be crushed under the inevitable. I have a friend—a humanitarian minister—given to visiting Count Tolstoi, who on one of these trips made note of that palace of St. Petersburg, said to be sinking in tbe morass, and quoted Kingsley's lines:

> So fleet the works of men,
> Back to the earth again
> Ancient and mighty things
> Pass like a dream.

No doubt this sinking palace is founded on plugs without proper distribution of its loads. If we use the earth reasonably, it will not be in so much of a burry to swallow us up.

Tbe moral aspect of these questions always asks a hearing. We are building a bigh and heavy structure of civilization. We can build it yet much higher, higher than the monument to Progressive America proposed by the French architect, but not if we depend upon foundations of a few heavy monopolistic plugs. If it is founded so tbat its benefits and responsibilities together rest broadly upon all the people, it will be well and permanently sustained by distribution among human elements of no extraordinary strength.

A Projected Merger.

A conference was held at Milwaukee, Wis., June 8th by officials of the United States Steel Corporation and representatives of tbe Allis-Chalmers Co. and the Wisconsin Bridge & Iron Co. Mr. Scbwab's private secretary and the chief consulting engineer were present.

Tbe session was held to devise plans for the amalgamation of tbe bridge and iron and Allis-Cbalmers plants in Milwaukee in a second billion-dollar consolidation.

Edwin Reynolds, chief engineer of the Allis-Cbalmers Co., said: "Wbile I have no hesitancy in saying tbat there is a good field for a billion-dollar trust, I am ignorant of any conference held here between the Scbwab and Allis-Cbalmers people. I understand Eastern men were in tbe city, but I cannot say as to the purpose of their visit."—American Manufacturer.

Casual California Comment.

"Funny," said tbe Tuolumne Co., Cal., man. "If that $12,000 pocket found last week near Stent bad been found in Siberia or Peru or Manitoba wbat a rush and scramble there would be to get there! But it's just California, where the sun and fruit and air are inviting enougb witbout tbe gold, and where you can ride on a broad gauge train almost anywbere."

"You California people don't know bow convenient you are fixed," said the man from Moose Creek, Idaho. "Wby, I was up in Nevada Co. some time ago, and tbe mine boss wanted to bave a new ore house painted. Now with us that would mean three weeks correspondence and tbree more freigbting. But tbis Grass Valley man telepboned to San Francisco and two days after I saw men slapping on tbe paint."

"Talking of telephones," said an attacbe of the Mining Bureau, "I think I made good use of one tbe other day. I went in to a man's place of business. I only wanted a minute's talk with him, and I knew be wanted to see me as badly as I wanted to see him, but tbe little tip-up of a clerk told me I must wait my turn. Tbere were four or five ahead of me, and I could see my man away at tbe other end through the open door of his office, and there was one of tbese desk telephones in front of him. It was tben 2 o'clock, and I saw I couldn't get to bim at the rate he was listening till 5. You know no matter bow important tbe talk going on, a telephone call is always quickly answered. Well, I went across tbe street, called my man up on tbe telephone, got him for an appointment at 2:15, and wben I soon appeared was able to tell tbe outer guard that I had an appointment with his boss and was immediately sbown in ahead of the others."

"That is a tremendous lot of metal," said a Treadwell, Alaska, resident sojourning at San Francisco, "that the Douglass Island people will have pounding next month. They will soon start up the 300 mill, which will make tbe wbole 880 stamps of tbe Treadwell group at work; they are 1050-pounders—nearly a million pounds of metal rising and falling in a ponderous dance. The shoes and dies wear out at the rate of about thirty pounds for every 100 tons of ore crushed."

"I heard a funny thing last week," said tbe man who was quietly smoking in the corner. "It relates to building eartb dams. In India engineers build a good many earth dams, and they do very well, when tbe earth is well packed. Tbey pack tbem by having a herd of sheep or goats on one slope of tbe dam while they are filling about 4 inches or so on the otber slope. Tbey put feed boxes on each end of the dam, and wbenever goats see a goat eating anytbing anywhere they think he bas sometbing good and rush for it, so that several hundred goats keep capering back and forth and thus pack the dam in a very cheap and effective way."

A man who hailed from Sierra county, Cal., now spoke up. He said he had a fine property to sell, but wouldn't go into any details till he had crossed the Mississippi.

"You bet I am not going to try and raise money in San Francisco; I am going to Cbicago," be said. "San Francisco may be all right for pretty, but she's no good. Wby, if San Francisco had the push and enterprise and nerve she had twenty-five years ago it would be tbe mining center of tbe world. Tbere is plenty of money here. Tbe banks are full of cash, but tbe owners of it won't play tbe mining game like tbey should.

"I ran across a prospector the other day who bad San Francisco sized up just rigbt. He said a San Francisco man was all right in his line, but mining isn't his line. You can't get a San Francisco man to go into a mining proposition if tbere is any ore in sigbt—he won't start to work on pay ore. Nobody can tell why, but he won't. If you can go to him tbougb and tell him that some poor devil of a prospector has sunk a shaft down to water level on a jumped claim, and bas been forced to quit work because of lack of money to buy a pump, the San Francisco man immediately becomes interested and will listen to the rest of your story, provided you tell bim tbat you can scare the fellow out of his cabin and jump tbe claim.

"But never say there is any pay ore in sight. Tell bim tbat the shaft ougbt to be sunk 20 feet below water level, tben a drift run 200 or 300 feet and a winze sunk at tbe end. Suggest to bim tbat if ore is not found at tbe bottom of the winze it would be a good idea to upraise for air, so tbat tbe drift may be continued a few hundred feet fartber. Estimate tbe cost of work about 100% high and let him beat you down to about the rigbt figure, but never tell bim you bave ore in sight, no matter if tbe wbole vein looks like a jewelry store.

"A San Francisco mining man doesn't want ore; he wants to mine."

"Right there, my friend," said a man from tbe mother lode, "is wbere you are away off. You simply don't know what you are talking about. San Francisco is the best town tbe mining man ever struck. San Francisco men are always putting up. I personally know of over $4,000,000 of San Fran-

cisco money that has gone into Tuolumne county alone in the past five years. And if a man has a fair prospect he can always get good accommodation in San Francisco by making the right kind of a showing. The trouble is San Francisco has long been looked upon as a good thing, and even if San Francisco were ten times as rich as it is, it couldn't buy every prospect, no matter how deserving. There are 17,000 partly developed prospects to-day in California awaiting capital."

"Whenever I hear a man talk like our Sierra county friend," said a dredging man from Butte Co., Cal., I think of the last time I was in New York. I was on Broadway with a native, and our attention was attracted by a sign, 'Trained Fleas Inside.' We've got any God's quantity of fleas in California, but neither I nor the native had ever heard of trained fleas, so we went in. There they were, dressed in clothing, driving coaches, going through marriage ceremonies and doing things that fleas might not he expected to do. They looked like fleas. After watching them for a long time I said, 'They're not fleas.' 'Why not?' asked the showman. 'Because they don't jump,' said I. 'They've heen trained not to jump,' said the showman. 'They used to jump, but they've quit. I'll show you how I train 'em.' He hrought out a glass hox whose top and bottom were very close together. There were several foolish untrained fleas in it. They kept jumping and striking their heads against the top of the case, when they would fall hack. 'There,' said the showman, 'that's the way we train 'em. When a flea has humped his head against the top of the case ahout a hundred times he quits jumping.' That's the way with San Francisco capital. It's head has been humped so often that it has quit jumping."

"Ever since January," said a Placer Co., Cal., mining superintendent who just joined in the symposium, "we have been feeding our friends and every one else oranges. It isn't every boarding house at a mine where all and sundry can have all the oranges they want, and I douht if anywhere else than in California such a thing is at all common. The oranges are fine, luscious ones, raised right in Placer Co., eaten hy Placer Co. miners—a home market—and cost $15 per ton."

"I have been reading," said one who till now had taken no part in the conversation, "of three California miners who had a good thing in the shape of a ledge from which they took free milling gold and had a crushing whenever funds were needed for current living expenses, hut who never took out more than enough for their weekly needs, arguing that if they milled more the bullion might be stolen or spent, and that the gold was safer in their mine than in any hank, and helieved there was something in it, till I heard some time ago of a mine hurglary at Grass Valley. As I heard it, in an upraise from the old workings a ledge was exposed which showed unusually rich ore. The drift showed a seam ahout 7 feet long and 6 inches wide, the value of which was estimated at $10,000. The superintendent left the ore just as he found it, so that the owners of the mine might see it for themselves. Meanwhile the news of the strike leaked out, as such things will. I was invited to accompany the owners, and when we got to the mine all we could see was an occasional piece of rich ore which showed what the ledge must have heen, but the great mass of the ore had heen carried off. The mine had heen closed, and the entrance harricaded, but the burglars broke into the drain tunnel, traveled 2000 feet to the shaft, 1500 feet farther to the drift in which the ore was exposed, and 800 feet to the hreast of the drift. They used the company's tools and powder, put in two holes, and blasted out the treasure, getting away with their plunder without creating alarm. As near as could he estimated they took out ahout 400 pounds of ore worth $20 per pound, four ore sacks heing missing. The burglary was committed while men were working in other parts of the mine, and the pump men heard the shots hut thought they were fired in the regular workings. And now I don't helieve so much in the safety of that kind of hank deposit, and I also know why mine superintendents so constantly try to keep the news of rich strikes from heing too generally noised around."

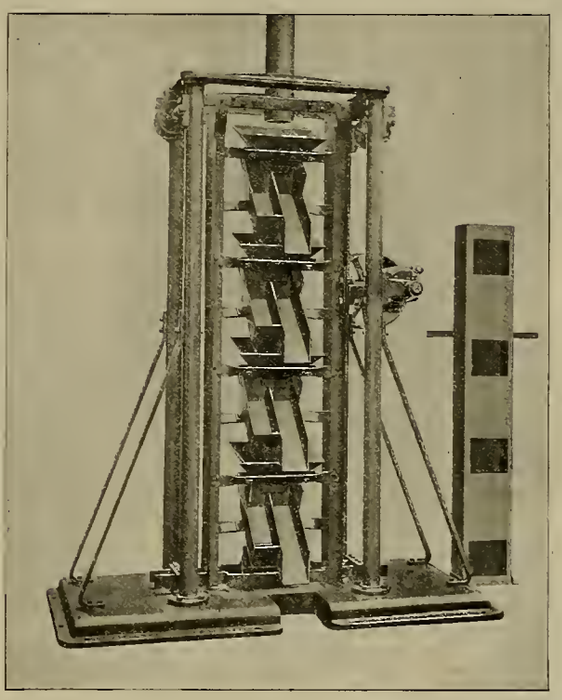
Pacific Coast Electrical Transmission Association.

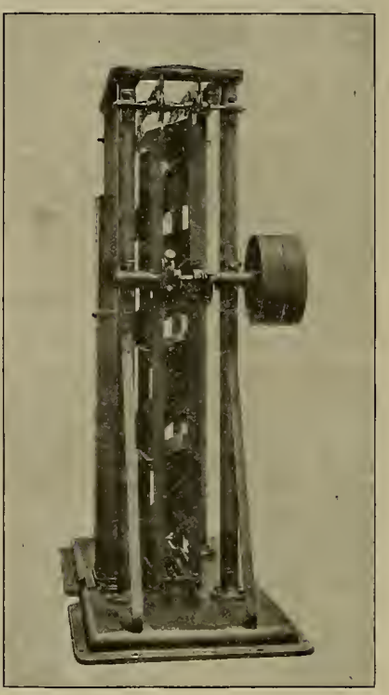
The Pacific Coast Electric Transmission Association held its sixth annual convention in San Francisco this week, heginning on the 17th. Dr. Chas. Van Norden of the Central California Electric Co., president of the Association, delivered the annual address. During the afternoon session the following papers were read: "The Economy of Electric Power in Quartz Mining," hy C. O. Poole; "The Application of Electric Power in the Comstock Lode," by Leon M. Hall, and read by Geo. P. Low; "Electric Pumping From a 1300-Foot Level," hy Donald H. Fry. A. McAdie presented an illustrated paper on "Cloud Versus Coal." A. J. Bowie Jr. read a paper entitled "Wells in Large Ranges," and Jno. S. Eastwood a paper on "The Hydraulic End of Power Transmissions."

E. J. de Sahla Jr. was elected president for the ensuing year, H. H. Nohle vice-president, Wm. Angus of Oakland was re-elected treasurer and Geo. P. Low was re-elected secretary.

The Foster-Coolidge Automatic Sampling Machine.

The machine as illustrated herewith consists of a succession of moving hoppers and dividers, placed alternately one ahove the other. There are four hoppers and four dividers. The hoppers are fastened to the front one of two horizontally moving frames. The dividers are fastened to the rear frame. These frames are suspended on rollers at the top of the machine, the upper crosspiece of each running in grooves in the rollers. These rollers are free to revolve on a fixed axle. Each frame is guided at the hottom hy two pairs of short pipes holted to the hase. The verticals of the frames are of light angle iron, hent at the top and riveted helow to the guiding crosspieces. To the verticals are riveted the cross irons that carry the hoppers and dividers. The hoppers and dividers are single castings of quarter-inch cast iron, holted to the crosspieces. Each divider has a partition in its center separating the discard from the sample channels. The upper end of this partition is cut away to prevent a large piece of ore heing caught hetween it and the hopper above. The lower end of the right hand, or discard channel, is open, and extends into the discard chute in front. The lower end of the left hand, or sample channel, is closed hy a partition. Immediately behind this partition is a square opening in the bottom of the channel. The end partition and sides are extended downward into the hopper helow.





Foster-Coolidge Automatic Sampler.

The two frames carrying the hoppers and dividers are attached hy connecting rods to two eccentrics. These eccentrics are driven by a pulley at the right, and move the frames horizontally and in opposite directions. They are designed to have the delivery openings of each hopper fully over, first, the sample, and then the discard channel at extreme positions. The hoppers are all alike, as are all the dividers. The delivery projection of the last sample channel moves in an inclined sample chute, which extends through the hase.

The discard chute, shown detached and reversed in the first cut and in place in the second, has openings wide enough to receive the discard channels and allow for their motion. The lower three openings are guarded from falling ore hy iron plates holted inside the chute and just ahove the openings. These act as deflectors for the ore.

The base and top are of cast iron and are formed hy 2½-inch pipes. The frame is stiffened by four braces, as shown in the cuts. The machine stands 7 feet 3 inches high and occupies 5 feet 10 inches by 2 feet 9 inches floor space. It is driven hy a 3-inch helt on a 14-inch pulley. The speed is 150 revolutions per minute, which means 150 complete oscillations for each frame.

The ore, not over 1 inch for this size machine, is fed through a 4-inch pipe into the first hopper, as shown in the first cut. There it is mixed hy striking the inclined sides of the moving hopper and delivered first to the sample and then to the discard channels, allowing only the ore that can pass in one-fifth of a second to fall into either channel at one time. The ore is thus halved hy dividing the stream in successive sections of from one-fourth to three pounds and retaining each alternate section to represent the whole.

The ore which enters the discard channel is delivered to the discard chute in front; that which enters the sample channel passes through the opening at its lower end and into the hopper helow, where the process of mixing the ore and its distribution between the channels of the next divider goes on as hefore. The sample is thus reduced from one-half to one-fourth of the whole. This process is repeated twice more, reducing the same to one-sixteenth, which is delivered to the sample chute at the hottom of the last divider.

The ore passing into any of the sample channels is retarded, first, hy striking the hottom; second, hy striking the end partition of the channel; and third, hy its passage down the hopper helow. This process, taken together with the rapid motion of the parts, is designed to thoroughly mix the ore before each reduction.

The machine of the dimensions here given is stated to have a capacity of from twenty-five to thirty tons of ore or matte per hour, or all the material that can he made to pass a 3½-inch square opening.

The following are tests furnished hy the manufacturer, showing results hy this sampler as compared with hand sampling, that is, quartering; 4000 pounds copper matte sampled and resampled:

MACHINE SAMPLES.	Copper. %	HAND SAMPLES.	Copper. %
First run through	34 94	First sampling	35 04
Second run through	35.02	Second sampling	34.99
MACHINE SAMPLES		HAND SAMPLES.	
First run	25.76	First sampling	25 92
		Second sampling	25.69
MACHINE SAMPLES.		HAND SAMPLES.	
4000 lbs. ore	23 13	4000 lbs. ore	23.23
4000 lbs. ore	21.22	4000 lbs. ore	21.16
4000 lbs. ore	23.10	4000 lbs. ore	23.15
Average of 12 lots are:		Average of 12 lots are:	
4000 lbs. each	25.25	4000 lbs. each	25.33

The machine is manufactured hy Winthrop Coolidge, 310 Western Union Building, Chicago, Ill.

American Brains and English Bricks.

J. C. Stewart, the American contractor, whose record bricklaying performance in connection with the erection of the British Westinghouse Electric & Mfg. Co.'s works at Manchester, England, recently caused so much discussion, has been engaged by the Midland Railway Co. to supervise and expedite the work at the mammoth Midland Railway Hotel at Manchester, England. The contract is in the hands of W. Brown & Son of Salford, England, and it is said that they are to receive $100,000 in bonuses if the work is finished within a year, and $10,000 a month for each month shorter than that time. The total price is $5,000,000.

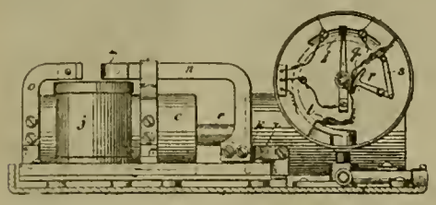
THE altitude of the Colorado river at the Needles, Cal., is 450 feet; at Yuma, Ariz., 107 feet—a fall of 347 feet in 281 miles, or 12.2 feet to the mile. The distance on a straight line from Yuma to the Needles is 147 miles—one-half the distance hy river. The Colorado river drains 225,000 square miles, principally from Colorado, Utah and Wyoming, from the melting snows. It flows about 2,500,000 miner's inches during its annual June rise. At midwinter reaching its lowest stage, the flow is about 200,000 miner's inches.

Mining and Metallurgical Patents.

Patents Issued June 10, 1902.

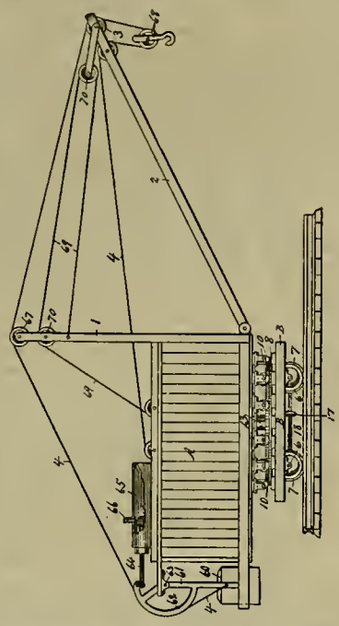
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

AUTOMATIC CONTROLLERS FOR ELECTRIC MOTORS.—No. 701,843; N. A. Christensen, Milwaukee, Wis.



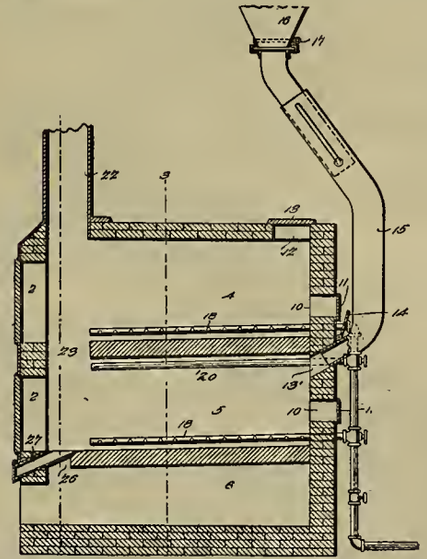
Automatic controller combination, two solenoid magnets arranged in line having common plunger movable axially therein, main switch having contact pieces, one of which is mounted upon plunger, movable therewith into and out of engagement with the other, primary switch having minimum and maximum pressure contact pieces, fluid pressure actuated contact piece for controlling circuits of magnets, normally engaged springs in circuit of switch opening magnet, circuit breaker carried by plunger adapted to separate springs when main switch is opened.

HOISTING AND CONVEYING MACHINE.—No. 701,887; S. Jackson, Fayetteville, N. Y.



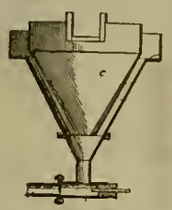
Windlass, suitable train of gears for operating it, main operating shaft 29, friction clutch which operates with last one of train of gears, rod 52, hand lever 53 by which friction clutch is operated, lever 54 secured to rod 52, shaft 55 to which lower end of lever 54 is secured, arm 56 secured to shaft 55, arm 57 pivoted to outer end of arm 56, shoe 58 connected to and operated by arm 57, and wheel 59 mounted upon central shaft 29.

ORE ROASTER.—No. 702,004; J. L. Hopper, Kirksville, Mo.



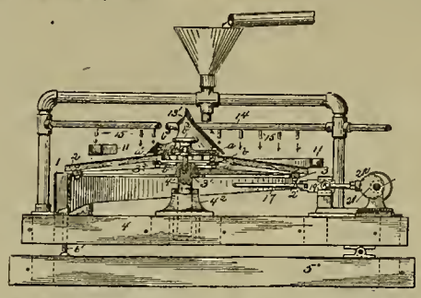
Combination in ore roaster, of lower cooling chamber 6, superposed ovens arranged thereabove having communicating flues or passages, oil supply pipes 18 arranged within each oven at point near floor level, oil supply pipe 20 arranged in lower oven at point near top of same, governing valves on pipes, removable chute 27 arranged at front end of floor of lower oven.

ORE SEPARATOR AND CLASSIFIER.—No. 701,851; C. Culver, Sandon, B. C.



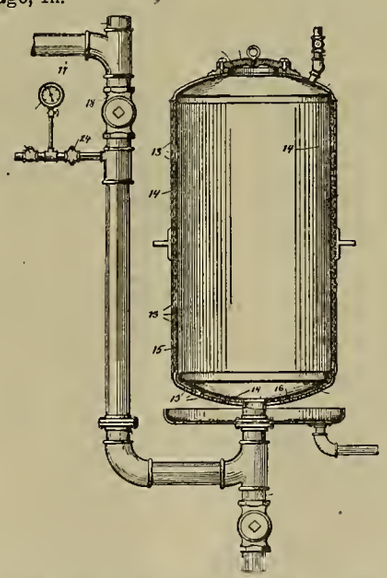
Ore classifier, comprising cone-shaped hopper forming settling chamber, inflow conduit leading into top thereof, secondary cone-shaped hopper forming assorting chamber, having its wide mouth attached to reduced lower end of main hopper, pipe having branch adapted to form means for upward current of water through hoppers, one or more flues leading from upper end of second hopper upwardly, trough surrounding upper end of main hopper into which flues dehouch, baffle plate comprising vertical dam portion extending from side to side of main hopper, across open top thereof, horizontal portion extending toward inflow conduit to check disturbance caused by inflow of water.

ORE CONCENTRATOR.—No. 701,859; W. G. Dodd, San Francisco, Cal.



Ore concentrator, comprising inclined circular table having an unriffled or plain portion adjacent its discharge for the mineral, series of curved collecting riffles arranged on the working face thereof and discharging onto plain or unriffled portion of table, means for imparting an oscillatory motion to table, and valve-controlled return launder or trough attached to and carried by table, launder or trough arranged to receive middlings discharged from table and to return same thereto at its head.

METALLURGICAL FILTER.—No. 702,064; F. H. Long, Chicago, Ill.

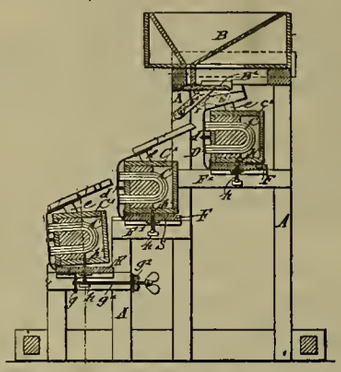


In metallurgic filter, combination with closed, perforated tank having an external drip pan and an internal fabric septum with stretcher frame therefor to rest against tank walls, of feed pipe leading into tank bottom and separate wash water pressure tube united to feed pipe between inlet and outlet valves thereof.

TREATMENT OF ORES AND MATERIALS CONTAINING ANTIMONY.—No. 702,153; J. P. van der Ploeg, The Hague, Netherlands.

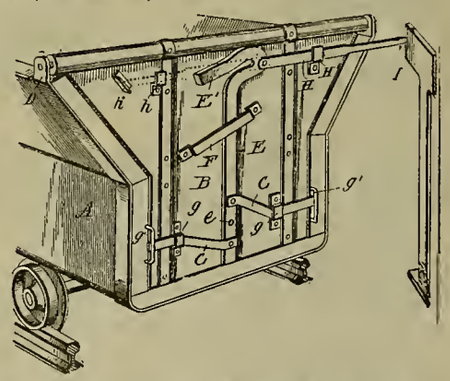
Method of extracting antimony from ores, materials or residues containing it, consisting in finely pulverizing material, mixing it with suitable quantity of powdered quicklime, mixing with it adequate quantity of sulphide of alkali-earth metal and water so as to form solution of lower and most soluble double sulphides as being best electrolytes without use of artificial heat or application of pressure winning antimony from sulphide solution as metal by electrolysis, then using several times solution from which antimony has been separated for treating new quantities of ores or materials containing antimony, or until antimony contents are practically completely extracted from ores or materials containing antimony under treatment, new quantities of quicklime and sulphide of an alkali-earth metal being added according to nature of antimony compound.

MAGNETIC ORE SEPARATOR.—No. 702,184; J. W. Carter, Franklin, N. J.



In magnetic ore separator, combination of gang of magnets inclosed in suitable box having poles of magnets projecting from front of same, vertically disposed septum secured stationary to front of box and over poles of magnets, septum having resilient upper end extending rearwardly in oblique direction, chute connected with and in same plane as upper end of septum supported on box, and means for simultaneously adjusting box and septum in forward tilted position.

MINING CAR DOOR FASTENER.—No. 702,265; J. H. Watt, Barnesville, Ohio.



The combination of mine car, its swinging door, latch lever pivoted thereto, bolts connected to lever, and latch bar connected to the latch lever, adapted to project beyond side of car; with cam plate fixed beside track adapted to engage bar and cause it to move latch lever and release bolts, overbalancing weight on latch lever adapted to move it still farther after bolts are released so as to retract bolts and bar within area or edges of car door so that they will not interfere with free swinging movements of door.

PROCESS OF EXTRACTING PRECIOUS METALS FROM THEIR ORES.—No. 702,305; E. D. Kendall, Brooklyn, N. Y.

Process of treating ores carrying precious metals, consists in treating such ore with lixiviating solution, consisting of cyanide, potassium percarbonate, and water, finally extracting precious metal from such lixivium.

THE velocity of the flow of underground water has been measured by C. S. Slitcher. The measurements were of the underflow in the sand of the Arkansas river. Two set wells were driven and electrically connected. Into the up-stream well was placed an electrolyte or dissolved substance which affects the electric current. The electrolyte entered the underground water at the first well and gradually passed down stream to the second. In the electrical circuit between the two wells the needle of an instrument recorded its approach, and was strongly affected by its final arrival. By watching the increasing deflection of the needle it was possible to trace the movement of the water from the beginning of the experiment and to study the variations of its flow.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

The Alaska-Mexican mine in May treated 21,842 tons of ore and 403 tons of sulphurets; estimated gross yield, $42,037; average, $1.92 per ton; working expenses, $24,706. The Alaska Treadwell mine crushed 83,967 tons ore and treated 1702 tons sulphurets at a cost of $75,949; the ore averaged $1.77 per ton; gross yield for month, $148,949.

The Valdes, Copper River & Yukon Railway Co. has given a contract for building 450 miles of road from Valdes to the Yukon to M. J. Heney, the road to be completed within two years at a cost approximating $15,000,000. Preliminary surveys were made last year under Engineer Gillette, who had leave of absence from his position with the Burlington Railway in Montana. He was chief engineer for Major Abercrombie in building the Government road to Copper river. Gillette sent fifteen surveyors to Valdes this week and will send another party by the next steamer. Rails for the first 70 miles have been bought and one cargo is en route aroud the Horn.

ARIZONA.

COCHISE COUNTY.

The Dragoon Copper M. & S. Co., whose properties, consisting of ten claims, are in the Dragoon mountains, 12 miles east of Tombstone, says it will do development work this season.

According to F. L. Dwight, Supt. Bisbee West Copper Co., there are only three companies in Bisbee, since the Calumet & Hecla and the Copper Queen absorbed other companies. The Copper Queen has 2000 men, and it is stated that inside of a year the Calumet & Hecla will have about 2500. In making its recent purchase of properties the latter company formed other companies inside the parent one; two of these are known as the Calumet-Arizona and the Calumet-Pittsburg.

Supt. Boag says that the reported destruction of the Exposed Reef M. Co.'s holdings was a mistake. The plant was saved by setting back fires.

COCONINO COUNTY.

J. W. Finch, State Mineralogist of Colorado, J. W. Francis and H. Jacoby are examining copper mines on the Navajo reservation.

GILA COUNTY.

The June copper product of the Old Dominion, including matte, is expected to be 900,000 pounds—about the same as the May output. The product of fine copper in May was 875,000 pounds; including matte, the product was 900,000 pounds.

Manager W. Sultan, Copper Hill Con. M. Co. of Globe, says he will erect plant for treating its ores. The company's properties are between the Old Dominion and the Globe Con. properties.

Supt. F. D. Adams of the Bob Tail M. Co. is putting in an additional battery of stamps at the company's gold mine near Ray. He will then buy machinery for the company's copper mine.

MARICOPA COUNTY.

The Pikes Peak gold mine, 8 miles southwest of Castle Creek Hot springs, on the boundary line between Yavapai and Maricopa counties, shows the contact to be schist and porphyry, the vein matter being a lime spar. The lode is about 600 feet wide.

The Electra mine, 10 miles from Wickenburg, has at 120 feet an ore body 2½ feet wide.

A telephone line is finished between Octave and Congress Junction, and twenty-two men are building the line to Wickenburg.

The Montezuma lead and silver mine is sold to the Wickenburg Smelting Co. for $5000 cash. The property lies near Morristown.

MOHAVE COUNTY.

The last payment on the purchase price of the Leland-Mitchell mines has been made. T. Ewing is the owner of the property. For this property J. H. West and S. Bedell received $150,000. T. Ewing is acting as general manager.

Chloride reports that J. W. Haas has sold the Woodchopper Relief mine to Los Angeles men for $15,000.

The Nighthawk M. Co. has sold the property to L. S. Smith and W. W. Phelps of Los Angeles, Cal. July 1st work starts up under the superintendency of A. J. Doran. A road will be built from the Oro Plata mine, Todd Basin, to Layne Springs, and machinery then placed on the mine.

A. I. Richardson, general manager Portales de Oro M. Co., has begun work on the property at Union Pass.

PIMA COUNTY.

The Cuprite mine in the Santa Ritas is bonded to Eastern men.

The Golden Rule C. M. & S. Co. has made a second payment on the Cuprite mine, 7 miles southeast of Vail's station, 20 miles east of Tucson, in the foothills of the Santa Rita range of mountains. The company controls eight claims and has been pushing development work on the properties for a year past. Supt. J. Gutendorf has developed an ore body 15% copper, $20 in gold and $5 in silver. General Manager Lake says the Golden Rule Co. will erect a smelter on the property to treat the ores.

PINAL COUNTY.

Supt. Bagsley of the Jack Rabbit mine, Casa Grande district, is assorting and sacking high-grade shipping ore, leaving the second grade ore on the dumps.

YAVAPAI COUNTY.

Fifteen miles east of Prescott, O. B. Marshall has bonded the Marshall group to Eastern men and will superintend development work thereon.

Supt. S. J. Goldie of the Aztec Copper Co. has sent a carload of mining supplies to the properties of the company for development work.

Supt. Gilmore of the Eureka G. & C. M. Co. will do 500 feet of development work and build necessary roads on the property near Jerome.

Supt. Pickerell has the shaft on the President mine down 500 feet and has started a drift from the 500-foot level.

The Cabinet mine is now known as the King Fortune. It is an extension of the Silver Belt. C. E. M. Beall is Supt.

Development work is being done on the Great Verde mine, midway between Jerome and the Verde river. They have a shaft down 120 feet where water has been struck.

M. R. Kiley, Supt. Oro M. Co., near Prescott, expects to start up the Oro Co.'s new 60-stamp mill July 10. He is working forty men.

CALIFORNIA.

ALPINE COUNTY.

Seventy men are employed at Loope, and as soon as the mill starts the force will be increased.

AMADOR COUNTY.

The Amador G. M. Co. has incorporated in Utah, J. L. Craig, president and treasurer; C. T. Wardlow, secretary. The company will operate the Kruger and Vaughn claims, near Jackson.

The 5 stamp mill recently on the Tripp mine, Plymouth, has been moved to the Hercules mine by the owners, Shields & Noe.

At the Sargent, near Jackson, the machinery from the Peerless is moved to the Sargent ground. Sinking continues.

The sinking at the Argonaut shaft is finished. During the past year in sinking operations nearly $50,000 have been expended.

At the Bunker Hill the Ledger says a portion of the ledge alongside of which they are drifting at the 800 level was blown out in the blasting operations, revealing rich ore. The extent of the ore body is unknown.

In the Keystone mine at Sutter Creek, in crosscutting through the hanging wall greenstone at the 500 level, has been found a new ore body 8 feet thick, 160 feet east from the main fissure.

Rich specimen ore is being taken out at the Bunker Hill mine on the 800-foot level, north drift.

When work on the 2000-foot station and chute at the Lincoln is completed crosscutting to the west will be started.

BUTTE COUNTY.

L. Williams is building a stamp mill at Lumpkin to be run by water power.

The 20-stamp quartz mill at the Miller mine, near Forbestown, is in operation; ten stamps are crushing quartz.

CALAVERAS COUNTY.

At Jackson, a judgment having been obtained in the Superior Court of this county against the Moore mine, with over 200 acres, the property has been sold by J. B. Luddy, as referee, for $70,250, to A. Frankel, who is locally believed to represent Mr. Nevills.

Near Angels the Sultana Co. employs a great many men. It is calculated that more than 1000 miners are working in and about Angels; the proportion of American miners is greater than before.

The Lightner Co.'s new hoist, to lift three-ton cars from a depth of 2500 feet, is under way. A new hoist at the Altaville mine, capable of sinking 1000 feet, is to shortly go in.

The Sierra railroad extension to Angels is progressing slowly owing to the scarcity of men; 120 men employed. The line will be completed next September. Freight is being delivered at Robinson's Ferry and teamed to Angels.

B. Thompson is at Murphys, where he will begin preliminary work on the canal from the middle fork of the Stanislaus.

The owners of the Blue Jay mine, near Glencoe, are about to put up a mill on that property.

The Utica Co. has bonded additional land for mining purposes. At the Utica electric plant at Murphys, work is pushed by Supt. Gurney. The pipe is nearly all laid and the new machinery on the ground.

At the Angels quartz mine work is progressing.

Near Angels, Supt. C. L. Morgan for the Sultana Co. is operating the Bovee and Fritz claims, adjoining the Angels property. The Bovee shaft is now 500 feet.

EL DORADO COUNTY.

Estey & Ball will put in a new engine and pump at their mine at Pi Pi.

A 200-ton plant is in operation at the Vandalia mine, near Shingle This property is owned by J. Rosenfeld's Sons of San Francisco. The mine and plant are under the management of C. E. Seymour and C. F. Staver. The new plant when completed will represent an investment of $100,000.

At the Mount Pleasant mine at Grizzly Flat, 20 miles northeast of Plymouth, are employed thirty-five men; the 10-stamp mill is crushing; sinking the main shaft is being continued.

The Lucero G. M. Co. is shipping concentrates.

All the valuable land for nearly 6 miles on either side of Tonopah has been located.

The Gamecock & Mammoth mine, near Shingle Springs, may be reopened and operated by a German company.

If the Pocahontas mine is reopened the property will be operated through a tunnel from the Union mine, 1 mile in length.

J. F. Bluett is operating the Pyramid mine, near Shingle Springs.

A. F. Levitt projects building a new mill in Dark canyon; the vein averages 40 feet, carrying gold values from $5 to $6.

FRESNO COUNTY.

The Independence Oil Co. has a contract for 6000 barrels a month to the National refinery at 30 cents for ten months.

C. C. Bradley, Supt. Caribou, says that well No. 4 of the California Oil Fields, Limited, is flowing at the rate of thirty-five barrels an hour.

The Pacific refinery, on the Santa Fe west of Bakersfield, when fully equipped will daily consume 900 barrels crude oil, which will make up into about 40% liquid asphaltum.

HUMBOLDT COUNTY.

At the forks of the Salmon Supt. Mills is building a flume to tap the main Nordheimer creek.

The Nordheimer mine has eleven men at work.

INYO COUNTY.

W. C. Pidge, for San Francisco and Eastern men, has bonded two groups of mines near Bishop—the Emily Enot and the Leidy mines; terms, $20,000, final payment in one year.

KERN COUNTY.

During May there were shipped from the Kern River field 3540 cars oil.

In the event of contracts being secured for transportation of 5000 barrels of oil daily for ten years, it is locally stated that the projected McDonald railroad from the Kern river oil field to Port Harford will be finished by Jan. 1, 1904. Contracts are said to have been signed for 3500 barrels already. The road would run via Cuyama valley.

MARIPOSA COUNTY.

Three mines owned by Early & Revel, Sweetwater, have been bonded by J. E. Fowler of San Francisco and T. A. Mitchell of Pacific Grove, Cal.

Seven carloads of lumber have been received by the Mariposa Commercial & M. Co.

MONO COUNTY.

The Crystal Lake M. Co., Lundy, has nearly 1000 tons of concentrates ready for shipment. The property is 12,000 feet above sea level.

NEVADA COUNTY.

The Gold Crown mine, owned by Tilton Bros., near Edwards' crossing, is in good ore.

Nine men are working at the Ironclad mine, near Rough and Ready.

The stamp mill on the Dr. Fouch property, near North San Juan, will be started up.

Suits involving claims aggregating $800,000 have been filed in the Federal courts against the North Star Mines Co. of New Jersey by the owners of the Norwich mine, claiming that the North Star Co. extracted ore therefrom. The defendants assert in their answer that the total value of such ore did not exceed $10,000.

R. I. Thomas has a contract to dredge the Middle Yuba river near French Corral.

PLACER COUNTY.

At Iowa Hill the leasers of the Morning Star have reached gravel by a bedrock tunnel 200 feet left of the main tunnel.

Near Spring Garden the Big Channel Co. has begun the tunnel to tap the gravel. Supt. Nesmith has charge.

G. Knutzen is manager Dardanelles, Bob Lewis and Sacramento gravel mines.

A pack train has left Cisco with supplies for the mines at Meadow Lake. Snow is still 2 feet deep on the road.

The 10-stamp quartz mill at the Central mine, formerly the Dorer, is in operation. F. Develey is Supt.

PLUMAS COUNTY.

C. Adams, Supt. Cataract M. Co., operating on North Fork of Feather river, has twenty men at work on the Giraud claim, and others cleaning out and repairing the Lott ditch.

D. Finlayson Jr. is operating the quartz mill on the Talbot mine, Light's canyon.

Work on the electric transmission system of the Western Power Co. of Los Angeles, involving the diversion and storage of the waters of the north fork of the Feather river, in Big Meadows, has begun at several points. As many men as can be handled to advantage are employed in the preliminary work of opening roads and trails.

SAN BERNARDINO COUNTY.

At Dale, in the O. K. mine, there are 1800 feet of development. The ore averages $18.50 gold per ton. The ledge is in places 100 feet between walls; hanging wall is porphyry, footwall granite.

SAN DIEGO COUNTY.

The thirteenth annual report of the Free Gold M. & M. Co. shows receipts for April $48,069; expenditures, $22,118.69; liabilities, $6500. The cleanup of the cyanide plant showed $11,700. The report was read June 6.

The machinery is arriving at Picacho for a cyanide plant capable of treating 1000 tons of ore daily. The company has fifteen claims at Picacho. The narrow gauge railway from the mine to the mill site, 6 miles, will be finished in September. Ore will be taken from the surface by means of open cuts and hauled directly to the mill for treatment.

SHASTA COUNTY.

Four carloads of lumber are at Redding for the dredger of the Detroit & California M. Co., which proposes to operate on Clear creek near Horsetown.

The Balaklala group of sixty copper claims, Flat Creek district, under bond for $650,000 to Pennsylvanians, may be taken by them. They have already paid $165,000, which may be considered to insure the sale, which will put another smelter in Shasta county. It is a big low-grade proposition. The ore will yield net returns of $3 a ton. C. A. Malm, San Francisco, is president of the present owning company.

The Murray-Conroy-Weil mine, Flat creek, is bonded to the G. W. G. M. Co. for $10,000, for a year. The same company has bought for $250 the Alta mine, sold under execution.

The Mount Shasta Gold Mines Corporation, mainly Chicago men, which owns the Mount Shasta gold mine, have the McClure copper group on Bully hill. The company has bought the townsite of Sallee for a smelter site, and says it will erect a reducing plant.

SIERRA COUNTY.

Development work is being pushed on the King mine, between Marguerite and the Keystone mine.

The H. R. Case Co.'s cyanide plant at the Young America mine is in operation.

The Pilgrim mine at American Hill, owned by the English - American G. M. Co., under the management of T. A. Patterson, Jr., has a body of high-grade ore in No. 4 tunnel. This tunnel is a crosscut for 600 feet. After cutting the vein a drift was run on the ledge 250 feet, at which point the ledge is 5 feet wide and in free gold and galena sulphurets.

The Bellevue tunnel is being run to tap the Thistle Shaft gravel channel below the old works. The tunnel is run 70 feet a week. It is now in 2700 feet. The company employ fifty men. From the mine to La Porte a wagon road, 5 miles in length, has been built.

E. Squier is foreman at the Tabor mine, near Gibsonville. The tunnel to tap the channel is in 3500 feet. They are in soft slate.

A gravel strike is reported from the Steamboat property, near Alleghany, where Jones & Evans are reported to have struck the red channel and taking out rich gravel.

The American quartz property there is also reported to have struck rich ore.

SISKIYOU COUNTY.

Newkirk, Northcutt & Quigley are opening new mining ground on Klamath river, between Honolulu and Walker. With giants and hydraulic elevator they

will sink open cuts to bedrock, expecting to raise pay gravel from 2000 to 2500 yards into sluices at an incline of 45°.

Driving the tunnel at the Cherry Hill mine on Cherry creek progresses. Supt. Baker expects to strike the vein within 100 feet further drilling.

Near Callahans the Sheba mine, Pattison creek, and the Rusby mine, Deadwood creek, are being operated.

The Helene G. M. Co., owners of the McKeen property, is operating its cyanide plant.

Wood & Sheiden of Rainbow, 1 mile south of Sisson, and E. B. Edson have bonded to E. Harrison, for an English company, a group of copper claims for $100,000.

TRINITY COUNTY.

A 5-stamp mill is being erected on the Hershey mine, northern Trinity.

The Fair View M. Co. will operate at Minersville; directors, C. and L. Allenberg, I. J. Weil, C. W. Cross, H. Newburgh.

At Trinity Center Supt. Hoefler has temporarily closed the Headlight mill. A tunnel is in 400 feet, and when the pay shoot is struck the mill will again be started and cyaniding resumed.

The Oriole M. Co., Indian Creek, will put in a mill.

The La Grange mine is in constant operation.

TUOLUMNE COUNTY.

The water and electric plant of the Stanislaus Water & Power Co. will be near the Contention mine, 14 miles from Columbia. One surveying party will survey from the Sand Bar on the main Stanislaus river, where the water will be taken out down the line of the ditch which runs on the south side of the river. Another crew will survey for the power plant, the reservoir and the pipe line leading down from it. Thirty men will be put on clearing brush for the pipe line. The reservoir will be enlarged and cribbing built in several places. Seven thousand inches of water will be used to generate electric power. The remaining 9000 inches will be taken across the Stanislaus into Calaveras county to be used by the mines in the Murphy district. The company will build a sawmill at the head of Knights creek. About 8½ miles of flume will be required.

E. A. Wiltsee has sold to A. H. Ward of Alameda a quarter interest in Two Brothers Consolidated gold quartz mines, near Groveland, and a five-acre mill site, for $3000.

The Roosevelt M. Co., Chinese Camp, has a new quartz mill in operation. C. E. Uren is general manager and superintendent. The mine and mill employ 250 men.

Near Jamestown the Draper M. Co. will add ten stamps to its mill.

Jacksonville reports a strike in the Stanley mine.

At Big Oak Flat A. P. Dron has brought the hoisting plant of the Mississippi to the Nonpariel mine.

At Stent work is resumed at the Jumper and Golden Rule mines. The Jumper mill is in operation.

Ballard & Martin have bonded the Lady Washington mine and started miners at work. They will tunnel 500 feet to strike a vein once encountered in the old workings. If the vein is found, machinery will go in.

YUBA COUNTY.

The United States District Court has confirmed the Eynard condemnation suit and paid to the holder of the property, situated on the Yuba river, the sum of $2000. Work on the river by the Government is now scheduled to begin.

COLORADO.

ARAPAHOE COUNTY.

The Union ore sampling works, owned by the Union Ore Co., at Thirtieth and Wewatta streets, Denver, was destroyed by fire on the 15th. The loss is estimated at $30,000.

BOULDER COUNTY.

W. E. Alexander, manager Copper Ranch Co., Grand Island district, says that in the 180-foot level 30 inches of ore have been opened up which runs $30 per ton.

CHAFFEE COUNTY.

Denver men have bought the Washington and Smuggler mines at Granite. The Washington G. M. Co. has been incorporated under the laws of Wyoming. G. T. Martin is Supt. The mine is in the Mosquito range, 2 miles east of Granite, 18 miles south of Leadville.

CLEAR CREEK COUNTY.

Idaho Springs reports a strike in the Robert Fulton shaft on the properties of the Russell Gulch M. & D. Co. A streak of ore at a depth of 150 feet assays $45 per ton in gold, silver and copper.

Near Empire, in the Gold Bug group, Covode mountain, a vein, continuous from the surface, has been opened at several points, showing a crevice of milling and smelting stuff, averaging $10 for the former and two ounces gold for the latter. The Gold Bug ores, like those of all Covode mountain producers, carry copper in percentage sufficiently high to affect the mill returns. W. P. Clough is general manager.

At Silver Plume the Burleigh tunnel, to connect with the Seven-Thirty shaft, is pushing along. This will open up a big territory in a rich region.

C. Butterfield of Denver has let a contract to drive a drift on the Josephine 400 feet on Kelso mountain, near Brick Pomeroy's A. P. tunnel.

The Double Header group, on McClelland mountain, owned by the Colorado M. & M. Co., will drive the Wheeling tunnel to cut the Double Header lode.

Representatives of the Cherokee-Lanyan Spelter Co. of Springfield, Mo., are looking through the mine for zinc ores.

Near Idaho Springs, General Manager McClelland of the Monarch M., M., P. & T. T. Co. has the McClelland tunnel completed 2100 feet. It is 9 feet wide, 8 feet high, accommodating a double track. It will be pushed to the Freeland mine, 1 mile in from the portal, 200 feet a month, to cut the rich ledge at a depth of 2200 feet.

Idaho Springs reports that in driving the line west of the shaft on the Alpine, between Cascade and Trail Creek districts, 2 feet of solid smelting ore assays $400 a ton in silver. In addition to this streak there is said to be 3 feet of milling ore.

At Dumont Supt. Housing at the Kaverne mine is driving on the vein now in 400 feet from a crosscut tunnel which cut the vein nearly 1000 feet. Twenty men are employed. The company is enlarging its mill.

Supt. David Ellis has resumed work at the Dover mine.

The Old Town property of Kimball & Himrod in Russel gulch is working thirty-seven men besides the leasers.

EL PASO COUNTY.

General Manager H. Fullerton has the Telluride mill, Colorado City, in operation; capacity, 300 tons, not including the roasters, which have a capacity of 150 tons. The company is considering increasing the mill to 500 tons.

FREMONT COUNTY.

At Florence W. D. White has a contract for the removal of 240 tons per day of the tailings from the old cyanide dump at the Metallic mill, by a centrifugal pump, onto the concentrating table of the United States R. & R. Co.

The United Oil Co. has drilled into oil at a depth of 2500 feet in the well that is drilled to sea level near Williamsburg. The United Oil Co. had hoped that it would not find oil until it had reached a depth of 5000 feet, because it was desirous of determining what underlaid the ground at a depth of 4500 feet. The oil may be cased off and the well drilled deeper.

GILPIN COUNTY.

For the first week in June the shipments of ores and tailings from the Black Hawk depot to the Golden and Denver smelters and to the concentrating mills at Idaho Springs were 141 cars—a total of 2820 tons.

The new mill at Chase gulch is operating on ores from the Bonanza property. J. Cundy is in charge.

Before U. S. Commissioner Hinsdale, Denver, H. P. Lowe and T. S. Dines have sued A. J. and E. J. Richardson to recover $187,500, the balance due on the purchase price of the Topeka mine, near Central City. Three years ago Lowe sold the Topeka to the Richardsons for $300,000. The mine was supposed to contain a body of high-grade ore. The defendants allege that they were the victims of extensive "salting," and that the property was practically valueless. They forfeited their first payment, and Lowe and Dines are suing to recover the balance due.

Nebraska men, who have bought the Bant property east of Black Hawk, will put in a plant of machinery and a new shaft building 28x50 feet. G. D. Johnstone of Black Hawk is their representative.

J. F. Scheuer of Milwaukee has a bond and lease on the Cœur d'Alene property, near Central City. J. Mackey is in charge of the work and will put in new machinery.

Near Central City, a half interest in the Old Town mine, Russell district, is sold to L. R. Himrod of New York for $50,000 cash. The Old Town produces fifty tons per day, equal portions being handled by wagon and by tramway to Idaho Springs.

At Central City Supt. W. R. Benzie of the Ingalls G. M. Co. is shipping, with most encouraging results, ore to the Golden smelter and mill dust to the mill at Black Hawk.

HINSDALE COUNTY.

Cummings and Kennedy of Florence have claims near Lake City, between the Golden Fleece and the Inez mines, which they will work.

In the Keystone shaft, Silver Cliff district, the ore is carrying increased values in lead and copper. Water is being pumped from the Hard Times; three shifts of men are sinking the Reveille.

LAKE COUNTY.

The Yak M., M. & T. Co., Leadville, has ordered a new compressor for their tunnel.

Cleaning and timbering the Yak tunnel, preparatory to starting to drive the bore to the Ibex ground, is completed, and driving begins July 6. The distance to be driven is 1450 feet. During May the Yak people shipped 5000 tons—the heaviest tonnage in its history.

At Leadville the A. M. W., Minnie and Mahala have been combined and sold to New York men. S. D. Nicholson is to be general manager of the new company. J. F. Rodman resigns his position as manager of the Arkansas Valley smelter to be financial agent of the new concern.

Manager T. S. Schlessinger of the Morocco M. Co. and the Welcome property, is operating the Last Chance mine for the Cerussite M. Co. The ore is a lead-iron sulphide, carrying gold and silver.

MESA COUNTY.

Grand Junction reports a pyritic smelter to be built there on a site donated near the sugar factory.

MINERAL COUNTY.

A fire on the 18th inst. at Creede destroyed $200,000 worth of property; two lives are believed to have been lost.

At Creede a new 300-ton mill is in operation and treating free milling ore at a profit.

OURAY COUNTY.

In Ouray the Revenue Co. is credited with projecting a tunnel through the length of the mountain from a point near the Batchelor switch to their shaft in the Sneffels district, to cut the Revenue veins at a greater depth and drain the mine of water. The main shaft on the Revenue is down 1000 feet below the level of the present tunnel.

The Revenue Co. is arranging to handle its ores on the Telluride side, presumably through the Ophir tunnel and the mill at the Cimarron.

Near Ouray the Portland reports a good strike. D. Wood is manager, A. Gould foreman. The crosscut tunnel is in 845 feet and intersects a vein 6000 feet in length. The vein in this tunnel was cut at a distance of 520 feet. About 300 feet of stoping has been done. The ores in the stopes consist of grey copper, lead, brittle silver, yellow copper, zinc, gold and chloride.

PITKIN COUNTY.

(Special Correspondence). — The Argentum Juniata mine has closed down indefinitely.

The Mollie Gibson mine is running full handed. It is reported they have made a large strike, but same is not yet confirmed by the management.

The Hunter Creek mill is handling ninety tons of ore daily from the Della S. mine, concentrating about eight tons into one; runs 6½ ounces silver, 4½% lead. The Smuggler zinc mill is handling 150 tons every twenty-four hours and the Smuggler lead mill 160 tons in about eleven hours. D. Cole is Supt. of the mills.

Aspen, June 14.

SAGAUCHE COUNTY.

The new mill at Crestone is working regularly.

SAN JUAN COUNTY.

The Tahasco M. Co., on the San Juan-Hinsdale line, will erect an up-to-date concentrator at the mine. This property is 12,000 feet above sea level.

Grading goes on for the new 200-ton Silver Ledge mill to be erected near Chattanooga.

The Yukon tunnel is now 1120 feet in Boulder mountain. Work is also in progress at the upper Lamont tunnel.

SAN MIGUEL COUNTY.

Manager J. Barnes of the Telluride Coal M. Co. has a tunnel 200 feet north of San Miguel in which the body of coal has increased in size. It was less than 1 foot on the surface, but now there are 2 feet of clean coal of a semi-anthracite character.

Manager C. Anderson of the Nellie has men doing development work.

T.-Elliott, Supt. Smuggler-Union's old mill at Pandora, and W. Morrison project a mill to treat ores from the Sheridan and other dumps of the Smuggler-Union Co. in Marshall basin. Work was started last week; it is expected to have the plant in operation by Aug 1. They have a lease on the Smuggler-Union dumps.

The Ella G. M. Co. at Telluride, just incorporated, capital $20,000, will begin work on the Nellie and Ella group.

SUMMIT COUNTY.

At Kokomo the Michigan mine, Sheep mountain, is shipping ninety tons of ore daily.

Near Breckenridge, Supt. J. F. Hight of the Wellington M. & M. Co. is running a 700-foot tunnel on the Wellington, to strike the main vein.

At Swandyke A. J. Vanco is operating the Three Kings mine.

Manager E. A. Finding of the Breckenridge Deep M. Co. has good ore in the 310-foot drift.

TELLER COUNTY.

(Special Correspondence). — The Independence shaft on Hull City Placer, Cripple Creek district, collapsed this week. All the machinery and gallows-frame may have to be removed from the shaft. W. P. Dunham is manager.

Cripple Creek, June 11.

At Cripple Creek, of the thirty-eight sets of lessees developing the Anaconda estate, fourteen are in ore. The whole property is now under lease. The 1000-foot level has penetrated the Vindicator-Lillie vein about 1000 feet from the shaft. The vein is rich. The screenings yield $100 a ton.

The Mountain Boy G. M. Co. has raised enough money to develop their property on Raven hill, first sinking the shaft, now down 150 feet, to 650 feet.

The Metallic tunnel people, on Copper mountain, think that the present ore showing justifies the project of a $60,000 concentrating mill.

The Independence Con. G. M. Co. expects to pay its $40,000 indebtedness by July 1. The mine, the Hull City Placer, has produced $1,000,000, but lost its rich ore shoot between 700 and 800 feet. Search was made for it and the debt of the company incurred.

Crosscutting on the Ben Hur claim, on Gold hill, at a depth of 600 feet shows the vein. Some ore is being saved. The shaft will be sunk 200 feet deeper.

The Last Dollar has made a six-car shipment—two of high-milling ore and four of smelting ore.

Cripple Creek's proposed deep drainage tunnel would run in from the southwest, under Grouse mountain, starting 3 miles southwest of the Elkton property, near the junction of Cripple and Four-Mile creeks. The cost is estimated at $300,000 and it would take fifty months to complete the undertaking. This involves a monthly tax of $6000 upon the properties to be benefited.

June 10th was pay day in Cripple Creek. Stratton's Independence pay roll was $47,000, the Elkton Co. $22,000, the Mary McKinney Co. $13,500, the Chicken Hawk (Guyot hill) $2100, the Last Dollar $11,000, the Findley $4474; the Cripple Creek M. Co., the largest leasing company in the district, paid $20,000, the Joe Dandy on Raven hill $2500, the Granite mine on Battle mountain $8000, the Golden Cycle $13,000, the Vindicator $10,000, the El Paso $10,000.

The latest consolidation in Cripple Creek takes the properties of the Avalon G. M. Co., the Chicolo G. M. Co., the Helen B. Gould M. Co., the Hard Carbonate G. M. Co., into an organization controlling 11,173 acres. The new company will be the Chicolo Con. G. M. Co.

At Cripple Creek the last 20-ton shipment from the Rittenhouse will go $300 to the ton.

J. F. Burns, president Portland G. M. Co., says they are shipping usual quantity of ore; the greater portion of the force employed is on dead work. They have at the 1000-foot level an ore shoot proved up for 400 feet that varies in width from 50 to 90 feet. The new reduction plant at Colorado City is treating 200 tons a day. He thinks they will have to double the capacity of the plant. The ore now running through the mill is not being sorted, but will go $30 a ton.

C. F. Scherrer's suit against H. T. Weeks, lessee Thompson mine, belonging to the Elkton Con. Co. at Cripple Creek, in the U. S. Circuit Court, resulted in the jury giving a verdict for the plaintiff for $7250. Counsel for the plaintiff contended that a mine owner must adopt rules and regulations for the operation of his mine. If he fail to do so, he is liable for any injury which may result from lack of performing the duty. This principle has repeatedly been declared in reference to railroad companies, but had never before arisen in Colorado as to the operation of a mine. Defendant Weeks was held liable because he had not made a rule requiring the trapdoor at the surface of the mine to be closed before the shaft bucket was unloaded. The plaintiff, who was a trammer in the Thompson mine, lost his leg by being struck by a jackscrew which was dropped down the shaft by one of the miners.

At Cripple Creek the Blue Bird Co. has resumed sinking and expects to reach a depth of 1400 feet before water interferes again

S. Bell, Supt. Hull City property of the Independence M. Co., says that the company will wait a little before repairing the damage done by the recent sinking. A bulkhead may be placed in the main shaft at the third or fourth level, and the Cripple Creek M. Co., leasing the property,

will work through the Whiting shaft. The shaft is twisted and the machinery out of plumb.

IDAHO.

BANNOCK COUNTY.

The Fort Hall Indian reservation was opened with a rush on the 17th.

Prospectors and mining men held a meeting in Pocatello on the 13th and organized a mining distrlct on the portion of the Fort Hall Indian reservation thrown open on the 17th. The sentiment expressed at the meeting was that any intimidation would deprive those making them from sharing in the distribution of claims.

BLAINE COUNTY.

Manager C. C. Ruthrauff and Supt. Mechling of the Rosetta M. Co., operating on the Big Smoky and South Boise divide, near Soldier, are examining the Rosetta workings.

J. B. Laughlin, one of the owners of the Lucky Boy group, Idaho City, is in San Francisco. He says the Mountain Ram property is bonded and that his property will be worked this season.

IDAHO COUNTY.

(Special Correspondence).—The Great Unknown Placers, under Supt. J. Davis, are in operation.

The Newsome & Leggett Creek Hydraulic Co., with J. Surridge manager and A. D. Howell Supt., are running night and day with 800 inches of water, and have demonstrated that they have an unknown depth of gravel over 100 feet. The injunction obtained against them by parties who jumped their dump has been modified by the court, some of the alleged locations having been thrown out and permission granted to mine at central points, pending a decision on the main issue.

The Moose Creek placers of C. P. Richardson, with A. Bishop Supt., are working night and day, using 600 inches of water. They are now showing 200 feet of gravel and still hunting the bottom and north rim, which, so far, have not been found. The outlook is for a very short water season. Spring was very late opening and the starting of the water was followed by hot days and nights and warm rains, sending the snow off with a rush. The roads are lined with Thunder Mountain pilgrims—horse, foot—and one genius with a wheelbarrow.

Newsome, June 10.

OWYHEE COUNTY.

G. W. Venable has miners doing preliminary work on the Tiptop group, Florida mountain.

SHOSHONE COUNTY.

In the Skookum mine case at Wardner the Empire State-Idaho Co. says it either owes K. Hanley $147,000 or else nothing at all, on account of his eighth interest. Hanley claims that Sweeny & Clark unfairly got a deed from him for a one-eighth interest in the Skookum mine, was subsequently transferred to the Empire State-Idaho M. Co., and he wants an eighth interest in the ore taken from the Skookum by the Empire State-Idaho Co. without his consent. The defendants admit that ore has been taken from underneath the surface of the Skookum, but that it is from a vein having its apex on ground owned by the Empire State-Idaho Co. Hanley figures that the Empire State-Idaho Co. had removed ore aggregating 73,000 tons from the Skookum claim up to Feb. 15th; that the company was not entitled to any credits for the costs of mining the ore; that his one-eighth interest on that basis was $315,000. The Empire State-Idaho Co. allege that if Hanley is entitled to anything it would be only on the net profit of the ore after the costs of mining and of smelting have both been deducted. On that basis he would receive $147,000. They argue that Hanley is not entitled to anything at all, because of the extralateral features in the case.

WASHINGTON COUNTY.

At Landore a 350-foot tunnel contract on the Chieftain is done. General Manager Adams is expected to continue development work.

G. W. Moyer, general manager Thunder Mountain Placer M. Co., the townsite of Thunder Mountain being at the junction of West Fork and Monumental creeks, has an office at Weiser.

MONTANA.

CASCADE COUNTY.

Near Neihart, on the Silver Belt tramway, 318 men are at work. The Ripple mine will also use the tramway. The Silver Belt Co. is completing a 3000-foot trestle, from the ends of which the tram will connect.

FERGUS COUNTY.

W. D. Wrighter of Spokane has bought of A. H. Sellers of Maiden the Surprise group of mines for $30,500, payments to be made within the next fifteen months.

FLATHEAD COUNTY.

The Mollie Gibson Co. has three claims in Snowshoe gulch, 18 miles south of Libby, and says the vein in the property is 5 feet wide and the ore will run $30 per ton in gold, silver and lead. Helena has the office of the corporation.

GALLATIN COUNTY.

At Bozeman work has begun on the new properties of the Anaconda Copper Co. A side track will be laid and a town laid out when Engineer White returns from the Pacific coast.

LEWIS AND CLARKE COUNTY.

The Yellow Jacket group of seven claims, 15 miles southeast of Helena, is bonded by the Rose M. & M. Co. The vein is 35 feet wide. Assays run from $2 to $21.70 in gold per ton. The company proposes to develop it on an extensive scale preparatory to the erection of a stamp mill.

At Marysville the Drumlummon mine, owned by the Montana M. Co., reports the chief earnings are from tailings treated by the cyanide process. Last year 12,000 tons of ore were mined and 64,593 tons of tailings treated; net earnings, $75,457.

MADISON COUNTY.

The Watseka's new pump is being installed and everything ready to tap the vein at a depth of 600 feet.

Supt. McConnell of the Fourth of July group, Pony, thinks from tests that two sets of rolls for dry crushing through a 10-mesh screen, then cyaniding and crushing through a 40-mesh screen with a Griffin mill will be the proper thing for the mine's metal. Thirty men are at work.

Supt. Fuller shipped forty tons of ore from the Fairview mine at Sheridan last week.

Operations have been resumed at the Noble mine.

C. E. Lentz, manager Big Show Co., Sheridan, has bought the Lulu and Lone Star mines there.

A. Nesbitt has a lease and bond on the Bill Fairweather mine at the head of Mill creek.

At Rochester sinking continues on the Elgin mine, under the management of Mr. McClure.

B. T. Hickman is pushing work on the Abbie Alice property and is shipping ore to the Colorado smelter, some of which runs $100 to the ton.

F. R. Merk, owner Broadway mine, Silver Star, is having it unwatered, when work will be resumed.

SILVER BOW COUNTY.

An 800 H. P. electric motor for the Anaconda Co., at the Never Sweat mine, will run the compressor with power from the Canyon Ferry Power Co.'s plant on the Missouri river. The motor is the largest one in the State and was made expressly for use at that mine.

T. W. Fisher is drawing plans for a 40-stamp mill for the Bear Gulch M. Co.

NEVADA.

ELKO COUNTY.

The machinery of the Grand Prize & Union mill in Tuscarora is being demolished and shipped to Sacramento, Cal., as scrap iron.

LYON COUNTY.

R. W. Landrum of the Nevada Chief mine, at Rockland, advises his company at Los Angeles, Cal., to put in a 30-ton mill and cyanide plant. The mine is 28 miles south of Yerington.

NYE COUNTY.

A 500-ton lot of Tonopah ore has reached Salt Lake City, Utah.

Manager Healey of the Salt Lake & Tonopah Co.'s properties, at Tonopah, expects to tap the Fraction vein on its dip at or before the 250-foot level is reached.

The mines controlled by the Nevada Co. at Austin are said to be leased. S. T. Peterson is general manager.

The Tonopah City M. Co., organized under the laws of Arizona, has bought the Luetjens, Little Tono, Flying Dutchman and Big Jim Fraction claims. They will sink a double-compartment shaft and do extensive crosscutting. Officers: T. L. Oddie, president; A. J. Crocker, secretary; J. Salsberry, general manager.

STOREY COUNTY.

At Virginia the main building of the Butters plant will be 360x240 feet—the largest building in the State.

WASHOE COUNTY.

Near Steamboat Springs, Supt. F. A. McGuire of the Galena Hill G. & S. M. Co. has three ledges and is drifting to the main body of ore.

Supt. J. W. Hopkins of the Great Western mine, near Reno, has fifteen miners at work developing the property.

Supt. Crane of the Sparks M. Co. is locally credited with having bought the title of the Desert King M. Co. to the lateral extension of the Wedekind mine ledge for the Sparks Co.

WHITE PINE COUNTY.

Manager McGill of the McKinley Co. of Ely, says he has native copper at a depth of 200 feet.

Work will be started next month by the Chainman Co.

NEW MEXICO.

DONA ANA COUNTY.

The Torpedo mine at Organ has been drowned out. There was a cave-in and work suspended.

GRANT COUNTY.

In the Pinos Altos district W. Brandis has secured a lease on the Golden Giant 10-stamp mill on the Mammoth site.

At Stein's Pass, Supt. Rutherford has the mill of the Wilson M. & M. Co. in successful operation, putting ore through which runs forty-five ounces in silver and one-quarter ounce gold.

OTERO COUNTY.

Work at the large lead mines, near Tularosa, has been suspended. The machinery will be moved to Cook's Peak, Luna county.

SOCORRO COUNTY.

The Graphic smelter, near Kelly, is temporarily shut down.

The Cooney mine, owned by the Silver Bar M. Co., H. C. McCreary manager, is reported sold to W. J. Weatherby, manager Mogollon G. & C. Co.

TAOS COUNTY.

At the Fraser Mountain Copper Co., operating at Twining, Leffel turbines furnish 264 H. P. to drive the machinery for the smelter, mine and light. The tramway from the mines to the smelter has been completed, 1990 feet long. Capacity of smelter 120 tons a day. Three shifts are at work in the mines doing development work and piling up ore. The smelter starts July 1.

OREGON.

BAKER COUNTY.

The Phœnix property was bonded last fall by New York men for $80,000. Sinking at the Don Juan has opened up a ledge. The 10-stamp mill on the property is busy.

The Oregon Placer & Power Co. of Sumpter have men at work on Humpback mountain, Nevada gulch, Poorman gulch and the Sam Carpenter diggings near Greenhorn.

Sumpter reports the Badger concentrating plant, Susanville district, to have rolls with 30-ton capacity, besides the ten stamps. The Badger was recently bought by Bunker Hill & Sullivan interests of the Cœur d'Alene for $500,000.

F. W. Bradley, superintendent Bunker Hill & Sullivan G. M. Co., Cœur d'Alenes, and also the Badger mine, Susanville district, 65 miles from Sumpter, has spent a week at the Badger arranging for beginning work there with the new mill plant, to concentrate 100 tons per day, to be operating July 1.

A. B. Brown, in charge development work on the Snow Creek group, Greenhorn district, is arranging development work. The property was bonded last week to New York men for $60,000. A long crosscut tunnel will strike the lode at the lowest possible depth. At 200 feet the crosscut will reach the vein, when it is the purpose to drift fo- 500 feet.

On the Mayflower property, in the Cracker Creek district, J. B. Fryer is directing development.

Dr. Mueller, acting manager of the Oregon S. & R. Co., says he will build a smelter at Sumpter.

JACKSON COUNTY.

W. King has bought the Taylor Bros. mine on Hungry creek for $5000, and will put on a 5-stamp mill.

The Oregon Yellow Jacket M. & M. Co. is organized under the laws of Arizona to work a gold property 2 miles from Gold Hill, ½ mile from Rogue river.

LANE COUNTY.

Five carloads of steel rails for the railroad between Cottage Grove and Bohemia mines are on the ground.

SOUTH DAKOTA.

CUSTER COUNTY.

W. J. Ratte, Supt. Saginaw M. Co., is doing development work on the Saginaw mine, 11 miles northwest of Custer.

LAWRENCE COUNTY.

The Rossiter cyanide plant in Deadwood shows good results on ore from the Big Bonanza and Buxton claims, near Terry. It is treating fifty tons a day. J. V. N. Dorr is in charge of the mill. It is the oldest cyanide mill in the Black Hills.

At Deadwood a custom cyanide plant, 100 tons daily capacity, is to be erected by Boston men.

Roubaix reports ore on the 500-foot level at the Uncle Sam mine.

The Homestake M. Co. has its new settling plant in operation in Lead. It contains six tanks, 10 feet diameter, 16 feet deep.

The Alder Creek G. M. Co. has a $5200 bar of bullion, the result of the first clean-up at the new cyanide plant on Yellow creek, after a run of fifteen days. Eight hundred and fifty tons of ore were milled.

Supt. M. L. Day will resume work on the Lulu M. Co.'s property.

PENNINGTON COUNTY.

The Eagle Rock M. Co. is organized to work the Wealthy mine, near Keystone. It has a 10-stamp mill and 15,000 tons of ore ready to mill that will average $4 per ton gold.

UTAH.

BEAVER COUNTY.

E. T. Wolverton, manager Cave mine, Bradshaw district, is developing the property. He is shipping iron ore to the Murray smelters for smelting purposes. This carries 70% iron, besides values in gold and silver; smelter agrees to pay all transportation charges, give the mine all the gold and silver values and a certain rate per unit for all of the iron in excess of 50%.

IRON COUNTY.

The management of the Oregon Short Line coming to their relief, the owners of the exhaustless deposits of iron on Iron mountain, Iron county, will be permitted to enter the local market with their ores that will be accepted at the valley smelters and made to serve them as a flux. Owners of iron at Iron Mt. are notified by the American S. & R. Co. that they will take 300 tons daily at $2 50 per ton.

GRAND COUNTY.

The S. L. Tribune reports that returns have been received from the metallurgical firm of George G. Blackwell Sons, Liverpool, England, pronouncing the recent discovery of molybdenite ore in Basin district as genuine, but not of high enough percentage to make the product pay. They advise further development work to ascertain whether it is in streaky veins or a deposit. If of a depository nature it is worthy of expensive investigation.

The following is the substance of their report: "Molybdenum, found as the minerals molybdenite and coalfenite, generally occurs in beds, or is disseminated through crystalline rocks, such as granite, gneiss, syenite and granular limestone. The chief uses of molybdenum until recently have been in determining phosphoric acid by ammonium molybdenate and in preparing 'blue carmine' for coloring porcelain. The ferro-alloy of molybdenum is now used in making a special steel, to which it gives valuable properties. The production of this ore in the United States in 1901 was about fifteen tons, which does not near supply the demand. The ore to be marketable must contain over 45% molybdenum, and be free from copper. The average price of a 50% to 55% ore is probably about $400 per ton. The richest molybdenite ore yet found is that discovered near Leamington, Millard county, Utah, and in the Santa Rita district, Arizona, but in such small quantities as to make it unprofitable. In both instances the ore had a percentage of 45% molybdenum.

Blackwell further says: "The ore very much resembles graphite, or a dark colored lead ore, and never oxidizes. It flakes off like specular iron when cut with a knife and does not leave a glossy stain on the hand." Blackwell's analysis of the ore sent him from Basin gives 32% molybdenum and $3 in gold, the latter values no doubt coming in on the syenite rock contained in the gangue. The principal showing is on the Iowa property on Gold Hill mountain in a blowout, indicating a bed or deposit of the mineral.

JUAB COUNTY.

Ruby copper is reported at a depth of 2100 feet in the Mammoth M. Co.'s property. Gold-bearing ore is opened up 300 feet east on the 1800-foot level and followed down to the 1900 level.

J. R. Creighton, Supt. of the Tesora, has a lease on the Rabbit Foot at Silver City, and is working it. When the property was closed down it had been producing silver-copper ore of a value of $90 per ton, but the pumps were unable to handle the water. It has since found an outlet through a fissure connecting with the Sunbeam.

Eureka's city council wants bids for 4400 feet 2-inch pipe, 10,000 feet 3-inch, 1800 feet 4-inch, 3700 feet 5-inch pipe; and two tanks 16 feet high, 24 feet in diameter.

SALT LAKE COUNTY.

The towers for the United States tramway at Bingham are raised. Forty range from 16 to 80 feet in height, to support a cable spanning 17,000 feet. The work will be completed Sept. 1.

At the Bingham Con. the fourth furnace at the smelter plant is in operation.

SUMMIT COUNTY.

Supt. M. J. Daily will put in a new gallows-frame for the King, Park City.

TOOELE COUNTY.

Plans for an electric plant for the properties of W. A. Clark in Ophir canyon are under consideration.

D. Kelly, superintendent Sunshine mill, has the total earnings for forty days figured at $15,997.88, now on its way to the refinery. The crushers are taking 120 tons of ore daily. Thirty days' net earnings amount to $2000.49.

From Mercur comes a statement that a strike has been made in the properties of the Con. Mercur M. Co. that adds $1,000,000 to the valuation of the company's wealth. The strike is in the main electric tunnel level, disclosing ore that goes $13 in gold.

The Sacramento mill, Mercur, has started.

WASHINGTON.

FERRY COUNTY.

Because of the nearing of the completion of the Great Northern into Republic, preparation is being made to resume work on the Quilp, Black Tail and the Lone Pine - Surprise. Among the mines now being worked at Republic and which will soon start shipping are the California, Gold Ledge, Trade Dollar, Tom Thumb and Ben Hur.

LINCOLN COUNTY.

C. Grutt has upon the Egypt claim, Pitney Butte, 15 miles north of Davenport, a 2-foot vein of steel galena.

OKANOGAN COUNTY.

Supt. Oliver Tufty, Horn Silver Co., near Oroville, reports a strike at the 350-foot station.

SNOHOMISH COUNTY.

L. Bilodeau, Supt. Monte Cristo mill at Monte Cristo, has in the rear of the mill a tank so arranged that the concentrate water passes through a series of compartments with small opening doors to give the flow a slow motion and cause the water to travel in a serpentine course to catch the slimes.

WYOMING.

CARBON COUNTY.

At Grand Encampment, General Manager I. C. Miller expects by Jan. 1, 1903, that the Ferris Haggarty Copper M. Co. will give employment to 300 men. Supt. A. Brile will put in a 500-ton concentrating plant. The company has a contract with the Southern Wyoming Transportation Co. to furnish that company 200 tons of ore daily to the smelter; transportation $2 per ton. An electrical plant for operating the drills, hoists, etc., will be bought as soon as practicable. It is expected that the aerial tramway will be completed on schedule time.

FOREIGN.

BRITISH COLUMBIA.

Ymir reports that at the meeting of the stockholders of the Ymir Gold Mines, a Mr. Popkiss is coming to examine the property, accompanied by E. Hooper, a mining engineer. Increase of capital stock £20,000 was authorized for an electric plant. Supt. Barnhart reports that in twenty-nine days and five hours the mill crushed 6520 tons of ore, yielding $23,850 in amalgamation, and 440 tons of concentrates with a gross value of $12,160, making a total output of $36,010. For the last month only forty stamps have been working. The reason for shutting down the other forty is explained as due to the great quantity of water in the mine. The upper level has been stoped to the surface. As a result a sort of reservoir formed for the melting snow and surface water, and the pumps were unable to contend with the excess of water in the lower levels.

At Rossland the Le Roi pays the Great Northern railroad $80,000 a month, directly and indirectly. The freight rates wipe out the margin of profit upon most of the ore shipped from the mine. The Great Northern has not consented to lower some of its rates to the mine and smelter, but has the concessions under advisement. Meanwhile only the higher grade ore bodies are being stoped at the mine. If the railroad declines to concede, Manager McKenzie may close down the smelter. If the concessions are granted, the force at the Le Roi will be doubled and shipments made to Northport at the rate of 800 tons daily.

A. C. Garde, manager of the Payne mine at Sandon, has a contract with the Trail smelter to ship 500 tons of clean ore and concentrates monthly. The mine has considerable on the dumps, running fifteen ounces in silver to the ton. This will be put through the concentrator and the result be a concentrate going close to 125 ounces of silver and 75% lead. The crew at the mine numbers sixty. Mr. Garde states that the result of tests of electric drills at the Payne mine has been satisfactory. He has no confidence in the report that the American Smelting & Refining Co. will re-enter the British Columbia lead ore market, and believes that some improvement in the London market is the only solution to the Canadian lead miners' troubles.

At Nelson N. F. McNaught wants figures on a tramway for the Kilo group.

Phœnix reports during the last week one furnace at the Granby smelter was closed because of lack of coke. Shipments were as follows: Granby mines 6117 tons, Mother Lode 188, Sunset 120, B. C. mine 840, Jewel 240. The Granby smelter that week treated 8226 tons of ore.

The last spike is driven on the Kootenay & Arrowhead Railroad and trains running from Gerrard to Lardo.

Active operations have resumed at the Rambler-Cariboo mine with 100 men.

MEXICO.

CHIHUAHUA.

The Guaynopa S. & R. Co. owns fifty-four pertenencias in the Guerrero district of Chihuahua and is erecting smelters on the property for their own ores and for custom smelting.

Near Chihuahua H. Allen of the firm of Allen & Snyder has bought the Maid of Erin for $60,000.

SONORA.

The first shipment of copper bullion, the product of the new converters, four cars weighing 320,000 pounds, 98½% fine, was made last week from Cananea. Three converter stands are running.

On the Penasco Quemado a track has been run from the hins at the smelter into the workings. Ore assays 26 ounces silver per ton and some gold. He says "the ore from this mine can be mined and put into the bins at the smelter, cost not to exceed 40 cents per ton."

At La Fortuna, ore samples from the north half of level give from 4% copper and 20 ounces silver to 30% copper and 2400 ounces silver.

Developments on the Mina Grande and Cobre show the ore body to be 200 feet wide.

The U. S. M. & S. Co. is organized to develop the San Jose de Gracia mine (the Ahogada, it is now called) in Sonora. The property is located 45 miles from Hermosillo.

Supt. J. W. Walsh, Sonora M. & M. Co., operating the Penasco Quemado, La Fortuna and Mina Grande, says since last July the amount of work done amounts to 2450 feet, besides 17 miles of wagon road from Tubutama to the Penasco, thence to the Fortuna, Mina Grande and other mines.

SOUTH AMERICA.

The output of gold in British Guiana in 1901 was the smallest recorded for several years, the total production having been 102,182 ounces in 1901, as compared with 116,266 ounces in 1900.

SOUTH AFRICA.

The gold output of the Rand mines for May was 138,602 ounces, an increase of 19,014 over April.

The Rhodesian gold output for 1901 was 180,888 ounces, an increase of 69,385 ounces over the yield for 1900. The output since September, 1898, amounts to 399,441 ounces.

YUKON TERRITORY.

F. C. Wade says there are nearly 7000 miles of creeks unexplored in the Yukon, which, if so, would indicate that the day has not yet come for the suppression of placer mining by hydraulicking.

J. D. Meenach, general manager Reliance M. & T. Co., Dawson, says Klondike mining operations in the district are being carried on on a larger scale and with less expense than ever. There are still some large dumps on Dominion, Hunker and Sulphur creeks to be washed out. His company cleaned up $30,000 from the dumps mined during the winter, and expects to take out $100,000 during the summer. He is putting in centrifugal rock pumps.

The Lippy claim, on El Dorado, from which $1,500,000 in gold has been taken, has been sold to a Cleveland, O, company for $75,000. The spring cleanup on the claim was $130,000.

An order in council has been passed at Vancouver, B. C., amending Section 7 of the regulations governing placer mining in the Yukon, so that persons in the employ of an individual or joint stock company operating mineral claims are no longer required to have free miners' certificates. The words "and every person in his or its employment, except house servants," have been eliminated from the regulation. An order in council has been passed providing that a royalty of 2½% on the value of all gold at $15 per ounce shipped from the Yukon Territory from the 1st of May, 1902, shall be paid to the comptroller instead of the royalty heretofore collected. An order in council authorizing the Minister of the Interior to dispose of any mining claim forfeited under the provision under Section 41 of the regulations governing placer mining in Yukon has been cancelled.

Personal.

H. L. FRANK has returned to Butte, Mont.

W. N. MCGILL is manager Ely M. Co., Ely, Nev.

W. S. KEYES will in future reside in Napa, Cal.

HORACE MILLER is Supt. Hard Cash group, Elko, Colo.

R. M. KEEN is Supt. Old Spanish mines, Richfield, Utah.

CHAS. E. STEVENS is Supt. Stevens Copper Co., Clifton, Ariz.

THOS. NEILSON is in charge of the new smelter at Chloride, Ariz.

N. A. DUNGAN is examining mining property at Hailey, Idaho.

J. A. SNEDAKER has returned from Ely, Nev., to Denver, Colo.

T. L. HENDERSON is elected mining recorder, Searchlight, Nev.

D. H. JACKSON has returned from San Francisco to Tonopah, Nev.

JASPER R. RAND of the Rand Drill Co. of New York is visiting Utah.

JOHN B. HASTINGS is examining properties at Stanley Basin, Idaho.

H. C. BROWNLEE is Supt. St. Louis-Ontario mine, Park City, Utah.

J. W. OPP has charge of the Gold Standard mine, Jacksonville, Or.

H. J. LEWIS is examining the Golden Chariot mine, Rock Creek, Idaho.

C. H. HAMPSON has returned from Deadwood, S. D., to Denver, Colo.

MARK BRADLEY is the new manager Lion M. Co., Yavapai county, Ariz.

J. O. STEWART is Supt Anglo-Saxon mines, Rich Gulch, Calaveras county, Cal.

R. C. CAMPBELL - JOHNSTON is in charge of the Republic mine, Slocan, B. C.

T. REED succeeds J. F. McClelland in the Wyoming School of Mines at Laramie.

FRANK L. SMITH of Denver, Colo., has returned from a business trip to New York.

SAM W. CHEYNEY, Supt. Jamison mine, Plumas county, Cal., is at the works.

C. C. LONGRIDGE is examining newly discovered copper deposits in the south of Spain.

J. K. FLEMING, manager Lappin mine, Deadwood, Trinity county, Cal., has returned there.

C. C. WARD, Seattle, Wash., has been appointed chief engineer Wenatchee Improvement Co.

J. A. FRASER is appointed gold commissioner, Atlin, B. C., vice J. D. Graham, resigned.

THOS. COX, manager Morning mine, Mullan, Idaho, has resigned and will go to Portland, Or.

W. H. THOMAS, consulting engineer B. C. Copper Co., is at Vancouver, B. C., from New York.

E. F. MCCARTHY has been appointed assistant general manager Horseshoe M. Co., Pluma, S. D.

DR. J. B. MCLAUGHLIN has the appointment as physician for the Lightner mine, Angels, Cal.

SUPT. W. H. STORMS of the Baliol mine has returned from San Francisco to Sutter Creek, Cal.

GEO. WILLIAMS of Central City is manager Boulder County mine, Cardinal, Boulder county, Colo.

WILLIS G. MOORE has returned to Denver, Colo., from inspection of Montana mining property.

C. A. LAWSON of the J. Geo. Leyner Drill Co., has returned from Salt Lake, Utah, to Denver, Colo.

J. F. UHLHORN retains the superintendency of the Carson Valley, Nev., Smelting & Refining Co.

CHAS. WEIDER, former Supt. Moose mine, is now in charge of the Independent mine, Crestone, Colo.

A. DOWNE AND J. FOWLE of London are in Jackson, Amador county, Cal., looking at mining properties.

D. A. BUCHANAN, the mill man of the Cornucopia mines, Baker county, Or., is in Thunder Mountain, Idaho.

F. A. WING, U. S. assayer, Seattle, has returned from an inspection of mining property at Republic, Wash.

JOHN HAYS HAMMOND is visiting the Camp Bird mine, Ouray, Colo. He is accompanied by George Crocker.

V. G. HILLS of Cripple Creek, Colo., is examining mining property at Santa Maria del Oro, Durango, Mexico.

C. H. RICE of Ottawa, Ohio, president Yreka M. & M. Co., has returned from a visit to the Ball mine, Rollin, Cal.

J. C. MCCORMACK, former assistant superintendent Vindicator mine, Cripple Creek, Colo., succeeds A. T. Holman, resigned.

A. S. ADDITON is installing cyanide works for the Confidence G. M. & M. Co., Confidence, Tuolumne county, Cal.

D. RYAN has gone to Exland, Mexico, where he will act as general manager of the United States & Mexico M. Co.

OSCAR ROBERTS returns to San Francisco from Thunder Mountain, Idaho, this week, and then goes to Alaska.

PROF. PEELE of the mining department, Columbia University, New York, has returned from Park City, Utah.

J. SHROTE AND A. R. BENZIE of the Benzie Investment Co., Denver, Colo., are examining California mining property.

J. E. RIDGWAY, JR., is assistant manager California King G. M. Co., Picacho, Cal. A. Trumbo is foreman of the mill.

E. C. VOORHIES, president California State Miners' Association, has returned from San Francisco to Sutter Creek, Cal.

F. E. WARE, general manager Mount Shasta Gold Mines Corporation, has returned to Redding, Cal., from San Francisco.

E. E. BURLINGAME has returned to Denver, Colo., from Payette, Idaho, where he had been inspecting mining property.

F. BULKLEY is manager Robinson Con. M. & S. Co., Leadville, Colo. Supt. Doolittle, formerly with the Bimetallic plant, has charge.

DR. L. D. GODSHALL has resigned the superintendency of the Boston-Wyoming Smelter, Power & Light Co., Encampment, Wyo.

JNO. W. BENSON, late manager Camp Bird mine, Ouray, Colo., will have a mining engineering office in Denver, Colo., Jan. 1, 1903.

P. O. WELLS has resigned as Supt. Shannon Copper Co. smelter, Lordsburg, Grant county, N. M., and is succeeded by A. R. Bennie.

W. P. JENNEY, who has been expert-ing the geology of Neal mining district, near Boise City, Idaho, has returned to Salt Lake, Utah.

W. MCC. CAMERON has resigned as Supt. Small Hopes M. Co., Leadville, Colo., and goes to South Africa. A. A. Burnand succeeds him.

G. T. MARTIN will be Supt. Washington G. M. Co., a new organization that has bought the Smuggler and Washington mines, Granite, Chaffee county, Colo.

S. J. HENDY, president of Joshua Hendy Machine Works, leaves San Francisco next week with the Sierra Club for a jaunt through Kings River canyon, Cal.

SUPT. CARRERA has resigned as Supt. Lena M. & C. Co., Lordsburg, Grant Co., N. M. T. Ray has been appointed mine superintendent and E. L. Pennock mill superintendent.

GENERAL MANAGER H. A. SHIPMAN of Stratton's Independence, Ltd., Colorado, is slated for the management of the Camp Bird. R. J. Grant is mentioned to succeed Mr. Shipman.

A. GRAVES, manager Alma Copper M. Co., Carbo, Sonora, Mexico, is in Denver, Colo., making tests of the Alma ores to determine the character of the reduction mill or smelter his company will build at the mines.

FRANK L. SIZER, M. E., of Butte, Mont., has gone to Denver, Colo., on professional business, and from there will probably go to Guadalupe y Calva, Mexico, where he is still conducting operations on the Rosario mine, which is under bond to C. W. Clark.

MISS JOSEPHINE KELLETT, MISS LUCY KEMPER, MISS ISABEL LITTLE AND MISS CLARA CLARK are students in the Montana School of Mines, and say they think they can learn those things just as well as some of the young men at that institution.

C. L. BUCKINGHAM of Denver, Colo., returned there from Twining, N. M., where he had been superintending the erecting of a mill and smelter for the Fraser Mountain Copper Co., and is now in Salmon, Idaho, putting up a stamp mill for the Kittle Burton G. M. Co.

W. A. STEVENS, manager Big Buffalo mine, Buffalo Hump, Idaho, has resigned to take charge of the Cracker Jack. N. McGee, Supt. Big Buffalo, goes with Mr. Stevens as Supt. Cracker Jack. It is locally understood that W. Morrison will succeed Mr. Stevens as manager Big Buffalo.

F. M. SPAULDING, representing the Pacific Coal & Transportation Co., and C. A. Hardy have gone north to examine and report on the company's coal and other properties in Alaska. They go via Skaguay and the Yukon river, meeting the steamer Corwin at St. Michael, thence to Nome.

WM. FITZHUGH of San Francisco, Cal.,

gets $50,000 to inspect some Klondike properties for London men, who are credited with being former associates of Cecil Rhodes and with intention to invest $5,000,000 in Yukon mines.

J. GAYLEY has been elected to the hoard of directors of the United States Steel Corporation. He acted as vice-president since the formation of the company, and has had general charge of all material and transportation of the mines, ore, coal, coke, limestone, railroads, steamships and ore docks.

Trade Publications.

The standard sizes for pamphlets and trade catalogues, recommended hy all the principal engineering societies of the United States, are 3½x6 ins., 6x9 ins., and 9x12 ins.

SMALL POWER MOTORS —The Crocker-Wheeler Co., Ampere, N. J. Paper, 3½x6 ins.; pp., 24; illustrated.

Chiefly noticeahle for its fine illustrations showing size and practical application of various styes of small motors ready for immediate shipment.

HOISTING MACHINERY.—The Webster, Camp & Lane Co., Akron, Ohio. Paper, 6x9 ins.; pp., 90; illustrated.

A series of four, No. 1 describing direct-acting hoisting engines; No. 2, high-grade geared hoisting engines; No. 3, self-contained gearing hoists: No. 4, electrically driven hoists.

WIRE ROPE HAULAGE MACHINERY.—The Wehster, Camp & Lane Co., Akron, Ohio. Paper, 6x9 ins.; pp., 24; illustrated.

ORE CARS AND CAGES.—The Wehster, Camp & Lane Co., Akron, Ohio. Paper, 6x9 ins.; pp., 40; illustrated.

The entire series contains elaborate information on the several topics treated, with sectional profile views, tahles, prices, etc.

THE WILFLEY CONCENTRATORS. — The Mine and Smelter Supply Co., Denver, Salt Lake City, El Paso and New York. Paper, 6x9 ins.; pp., 54; illustrated.

Descriptive of this well-known concentrator, with general discussion of concentrating machinery. The ninety-one parts of the Wilfley tables are specified and separately depicted. The front page has as the motto: "The German idea is to dress ore well; the English to dress ore quickly; the American to do hoth."

MOTOR-DRIVEN AIR COMPRESSORS.—Christensen Engineering Co., Milwaukee, Wis. Paper, 6x9 ins.; pp., 24; illustrated.

Showing sizes and styles of motor-driven air compressors with capacities 7½ to 50 cubic feet free air per minute.

FURNACES, MUFFLES, CRUCIBLES, CHEMICALS, ASSAYERS' SUPPLIES. — The Denver Fire Clay Co., 1742-1746 Champa St, Denver, Colo. Paper, 6½x9 ins.; pp., 290; illustrated.

The eighth edition of an unusually fine trade treatise with nearly 2000 illustrations; condensed description and prices are given of as many articles in daily use by chemists, assayers, metallurgists and miners.

Recently Declared Mining Dividends.

	Payable.
Lightner M. Co., Angels, Cal, 5 cents per share	June 20
United Gold Mines Co., Cripple Creek, Colo., 1 cent per share, $39,947.69	June 12
Homestake M. Co., South Dakota, monthly regular dividend, 25 cents per share, also extra dividend, 25 cents	June 25
Daly-West M. Co., Utah, 40 cents per share, $72,000	June 16
United Gold Mines Co., Colorado, 1 cent per share, $40,000	July 5
Gold Coin M. & L. Co., Colorado, 3 cents per share, $30,000	June 26

Books Received.

"The Gold Mines of the World," is the pretentious title of a 380-page quarto, second edition, finely printed on glossy paper and superbly illustrated. It gives the author's personal impressions of what he saw in a visit to various parts of the globe and contains some interesting discussions of mines and mining methods. There is a sprinkling of facts, some very positive assertions and considerahle energetic criticism. It views things from a foreign standpoint hut with an insular capacity for prejudiced observation. Some of the contents of the hook are humorous, though the author seems to he serious throughout. It is written hy J. H. Curle, published hy Waterlow & Sons, London, and sold hy the Engineering and Mining Journal, New York; price $3.50.

Latest Market Reports.

SAN FRANCISCO, June 20, 1902.

METALS.

SILVER.—Per oz., Troy: London, 24⅜d (standard ounce, 925 fine); New York, bar silver. 52⅞c, refined (1000 fine); San Francisco, 52⅞c; Mexican dollars, 44½c San Francisco, 42½c New York.

COPPER. — New York: Standard, $11.50@11.75; Lake, 1 to 3 casks, $12.00; carload lots, $11.90; Electrolytic, 1 to 3 casks, $12.00; carload lots, $11.75; Casting, 1 to 3 casks, $12.25; carload lots, $11.25. San Francisco: $14.00. Mill copper plates, $17.00; hars, 18@24c. London: £53 5s, spot, per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London, £11 5s per ton.

SPELTER. — New York, $4.87; St. Louis, $4.50; London, £18 12s 6d per ton; San Francisco, ton lots, 5½c; 100-lh lots, 5¾c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lh. lots, 13@15c.

TIN. — New York, pig, $29.00; San Francisco, ton lots, 31½c; 1000 lbs., 31⅝c; 500 lbs., 31¾c; 200 lbs., 32c; less, 32½c; bar tin, ℔ lb, 37½c.

PLATINUM.—San Francisco, crude, $17.50 ℔ oz.; New York, $19.50 per Troy oz

QUICKSILVER. — New York, $48.00 large lots; London, £8 15s; San Francisco, local, $46.00 ℔ flask of 76½ lbs.; Denver, $50.50. Export, $43.50.

BABBITT METAL.— San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER. — Half-and-half, 100-lb. lots. 20c; San Francisco, Plumhers', 100-lb. lots, 16½c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $21.50; gray forge, $21.00; San Francisco, har, 2.75 ℔ lb .,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $36 25; open hearth billets, $36.75; San Francisco, har, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per bhl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1.60 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19.50; extra sizes higher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19.00; shingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d, Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; douhle tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL. — San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymho, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in hulk, $17 in sacks; Sunnyside, $11.75, long ton.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 27@28c ℔ lb.; carloads, 25@26c; in 10-lb. tins, 38c; sulphuric acid, in carhoys, 66% B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2¾@3c ℔ lb.; blue vitriol, 5¾@6½c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $2.00@2.25; flour sulphur, French, 2½@2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in hhls, 8c; caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 75c; cs., 80c; raw, bbl., 73c; cs., 78c; lots of 5 hbls., 1c less; Lucol oil, boiled, hhl., 65c; cs, 70c; raw, hhl., 63c; cs, 68c. Kerosene —Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13½c; Mineral Seal, iron bbls., 19c; wooden hbls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 16c; do., cs., 21½c; 86° Gasoline, bulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14½c; do., in cs., 21c; Lard Oil, No. 1 hhl., 60c; cs., 65c; Neatsfoot Oil, bbl., 70c; cs.. 75c; No. 1 bhl., 52½@55c; cs.. 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6¾c; 1 ton and less than 5 tons, per lb., 7c; 500 lbs. and less than 1 ton, per lb, 7¼c; less than 500 lbs., per lb, 7½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In hhls., 1 ton and over, 6¾c; do. in kegs, 7¼c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7½c; less than 500 lbs., 7¾c.

ASSAY LITHARGE.—Per lb, 8½c.

BISMUTH.—Subnitrate, per lb., $1.60.

BONE ASH.—4c ℔ lb.

BORAX.—Crystal, 7c: calcined, 25c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb, $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2¼ lbs.

PHOSPHORUS. — (American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00.

URANIUM.—Oxide, ℔ lb., $3 50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb., 10c.

ZINC.—Sulphate, ℔ lb, .04c.

(These prices are wholesale, f. o. h. San Francisco, unless otherwise noted.)

Commercial Paragraphs.

GILBERT WILKES & CO., Coronado building, Denver, Colo., are Colorado representatives Wickes Bros.' steam generators, Underfeed Stoker Co., Bullock Electric Mfg. Co., and Wagner Electric Mfg. Co.

THE Ironsides Co., Columbus, Ohio, advise us that its latest acquired additional specialty, the Ironsides improved patent Tormay mine car-wheel oiler, is heing rapidly adopted by the principal mining plants of the country, and that the general demand has taxed its facilities.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING JUNE 10, 1902.

701,840.—TYPEWRITER—H. B. Cary, Los Angeles, Cal.

702,123.—WELL CASING PERFORATOR—T. E. Clark, Visalia, Cal.

701,859.—CONCENTRATOR—W. E. Dodd, S. F

702,049.—FIRE STARTER—Draper & Lyon, Oakland, Cal.

702,092.—GAS GENERATOR—A. W. Edwards, Sacramento, Cal.

702 197.—TUBE MACHINE—J. J. Garrity, Pinole, Cal

701,871.—SEWING MACHINE—A. Giacomini, S. F.

701,872.—SEWING MACHINE—A. Giacomini, S. F.

702,008.—OIL BURNER—A. Johnson, S. F.

702,009.—MAKING CEMENT—F G. Jordan, Spokane, Wash

702,102.—BEDSTEAD JOINT—J. R. Konetsky, S. F.

702,370 —BED RAIL—E. G. Lundquist, Los Angeles, Cal.

702,022.—DISC PLOW—F. M. Mecum, Chico, Cal.

702,024.—HOOP LUG—R. B. Moore, S. F.

702 071.—HARROWS—N. Paulsen, Jolon, Cal.

702,377.—OIL BURNER—J B. Payne, Hanford, Cal.

702,073.—DENTAL TOOL—E. O. Pieper, San Jose, Cal.

702,079.—PIPE WRENCH—G. H. Swarthout, Placerville, Cal.

702,270.—WEATHER STRIP—B. M. Whiting, Spokane, Wash.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

STORM APRON FOR VEHICLES.—No. 701,614 June 3, 1902. W. G Reese, Oakland, Cal. The object of this invention is to provide an apron for the front of vehicles which by its peculiar shape serves to shed rain and snow and prevent its getting into the vehicle or upon the occupants. The apron has a pocket in front which is adapted to fit over the dashboard and it extends down upon each side thereof. The front portion has angular extensions and in connection with these extensions a body portion, the edges being so connected that when the apron is drawn up in front it forms a central ridge or apex so that the water is diverted to flow off on either side and is prevented from settling into pockets of depressions which may be formed in the apron. The shape also enables it to fit closely along the sides to prevent ite heing blown up hy wind.

SAW FILING DEVICE.—No. 701,700. June 3, 1902. J. H. L and G. A. W. Folkers, San Francisco, Cal. This device consists of a frame to be rigidly secured to a support and horizontal guide bar against which the side portion of the saw is to be held, a filing carriage standing over the saw and reciprocal along the guide and having oppositely rotatable filing members adapted to engage the teeth of the saw; a har below the guide and parallel therewith serves as a lateral support for the lower portion of the carriage.

OIL BURNER.—No. 702,008. June 10, 1902. A. Johnson, San Francisco, Cal. In this burner for liquid hydrocarbons there is an oil distributing plate disposed below the discharge end of the feed pipe and having its lower edge turned upward to arreet the flow of oil and form a shallow reservoir. The upper edge of this upturned portion has notches formed in it like teeth with channels leading down the outer front of the upturned portion so that any oil overflowing will be distributed by these channels and fall in a sheet which is caught by the air or other blast and driven forward out of the burner discharge.

HOOP LUG.—No. 702,024 June 10 1902. R. B Moore, San Francisco, Cal. The object of this invention is to provide a means for connecting the ends of hoops or rods which are employed for holding the staves of tanks and conduits together. It consists of a lug having one end adapted to embrace the head end of a hoop bolt, a plurality of bifurcations radially disposed projections on the block and means hy which the opposite end of the bolt is adapted to be engaged and guided and held between the projections so as to adjust the length of the bolt; the hoop being tightened by means of nuts screwed upon its threaded end and abutting against the lugs.

DISK PLOW ATTACHMENT.—No. 702,022. June 10, 1902. F. M. Mecum, Chico, Cal. This invention is applicable to that class of plows in which concavo-convex disks are journaled and revolnble upon a suitable frame and it consists in means for changing the lines of travel of the bearings so that the plows may be held up to their work and to regulate the width of furrows cut by them. A swinging draft pole is also so connected that the wheels may he turned in unison with the movement of the pole, and in connection with this is a means for multiplying the rate of movement of the wheels with relation to that of the pole. Means are also provided for raising and lowering the frame.

PIPE WRENCH.—No. 702,079. June 10, 1902. G. H. Swarthout, Placerville, Cal, one-half assigned to M. L. Smith, of same place. In this invention a flexible gripping member is connected with the end of a rigid lever and adapted to pass around the pipe, and this flexible member which consists of chain links is connected hy slipping one of the links over a pin on the end of a lever so that the movement of the lever will cause the chain to grip upon the pipe and turn it. The construction is such as to prevent the pipe being crushed by the pressure of the links when power is applied.

SITUATIONS WANTED.

Young man with a good knowledge of mining, and ho ding a certificate for aseaying, seeks employment as a chemist and assayer. Satisfied with moderate salary to etart. References furnished. Address J A., care of thia office.

PHYSICIAN AND SURGEON with three years' experience in both emergency and general hospitals, in aodition to experience in mines and private practice, wishes position in a mine. Best of references. Addrees Box 126, care of this office.

A young man with some experience at minee; course in both surveying and assaying, wishes position as assistant at some good mine. Good references. Address S. M. W., 404 Ellis, San Francieco.

PRACTICAL MILLMAN — AMALGAMATOR, Cyanide Man and Assayer, wishee poaition. School of Mines graduate. Beet referencee. Address R. B., care of Mining and Scientific Preaa.

WANTED.—Position hy experienced Electrician and Engineer. Repairing, armature winding, construction work, air machinery, general mechanica, etc. Familiar with mining and milling machinery. At present chief engineer Referencea. Addreae "Electrician," care Mining and Scientific Preas.

WANTED.—Position as Assayer and Bookkeeper in a mine; experienced in underground work; good references; present position not desirable. Address Box No. 127, care of this office.

CHEMIST AND ASSAYER, WITH TWENTY years' experience in mill and smelter work. Can run same. Address A. C., care of Mining and Scientific Press

MINING ENGINEER, practical miner and mill man, aasayer, etc., desires position of superintendent or assistant manager of a big property. Eleven years' experience. Best referenoea. Now working in aouthern California. Address A. M. P., care of Mining and Scientific Presa.

WANTED.—SITUATION AFTER MARCH 15, 1902, as Manager or Superintendent of mine. Have had five years' experience in manufacturing and constructing mining machinery and plants. Three years' experience in underground work. Four years' experience as manager and superintendent. Treatment of low grade ores a specialty. Practical in every detail. State location of mine and salary. Best of references. Address X. Y. Z., this office.

A technically educated Mining Engineer, at present employed as superintendent of mines for one of the largest corporations in Mexico, desires a change of position to the United States about July 1st. Has had 18 years' successful experience as engineer and superintendent, never having made a failure; 36 years of age; strictly temperate; a skilled designer, geologist and metallurgist, and a practical miner, as well as a hard worker and thorough business man. References of the highest order, including present employers. Address Supt., care this office.

EXAMINATION OR SUPERVISION of Mines, Smelters and Mills.

Mining Engineer and Metallurgist, of unquestionahle reputation and long experience, now permanently residing at Seattle, Wash., will examine or take general supervision of mines, smelters or mills, in Pacific Coast States, British Columbia or Alaska, as consulting engineer, for reliable parties. Is also reliable accountant to examine. Box 813, Seattle.

MINING AND SCIENTIFIC PRESS.

Whole No. 2188.—VOLUME LXXXIV. Number 26. SAN FRANCISCO, CAL., SATURDAY, JUNE 28, 1902. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

In San Francisco, Denver, Butte and other Western mining centers one daily sees some poor fellow, maimed or blind, begging on the streets, with a little card stating that he lost his limbs or his eyesight in a mine accident. The sight brings up the thought that such loss must be paid for somehow, in that case it being paid for by the charitable public. If the breadwinner of the family be killed or disabled, and there be no compensation from the employer, the support of the family falls on the public. In any case the regular law that runs through life makes it mandatory that somewhere, somehow there shall be compensation for all loss. This is a law that cannot be evaded or overruled, unlike laws of man in such cases. The thought brings up the question of compensation for injuries to working miners—how far the employer is responsible for such injuries. It is a problem that cannot always be correctly solved by judge or jury. Meanwhile the misery depicted on the faces of these unfortunates in city streets speaks for the greatest measure of safety to miners in a tone more eloquent than living voice can utter.

Steel and concrete are universally employed in foundations for all important structures. In the construction of the Owing's building, the Monadnock and other buildings in Chicago it was probably used for the first time, and since about 1885 or 1886 its use has been growing rapidly. It is one of the most durable forms of foundation constructions known, possessing as it does the qualities of fire resistance, economy and strength. The coefficients of expansion of steel and concrete are practically the same. As steel is a better conductor of heat, it is protected (in foundations) from heat by being imbedded in concrete, which is comparatively but slightly affected by heat. The steel is also protected from effects of the atmosphere by the surrounding concrete. This combination has many uses, being employed in the construction of foundations, walls, floors, roofs, interior and exterior coverings (such as decks) of steel ships, and there have been small boats built of cement (with sand) on wire netting. All cement mixtures with sand should be used as soon as mixed to obtain the best results. The proportion of sand, broken stone and cement should be such that the sand shall fill the voids in the broken stone, and the cement shall more than fill the voids in the sand by say 10%. Practically, the voids are equal to one-half the solid mass. Each layer of concrete should be deposited about 10 inches deep, and allowed to set over night before the next layer is put in place; the surface of the concrete should be cleaned and thoroughly wet before the next layer is deposited. Concrete kept wet for two or three weeks will give best results.

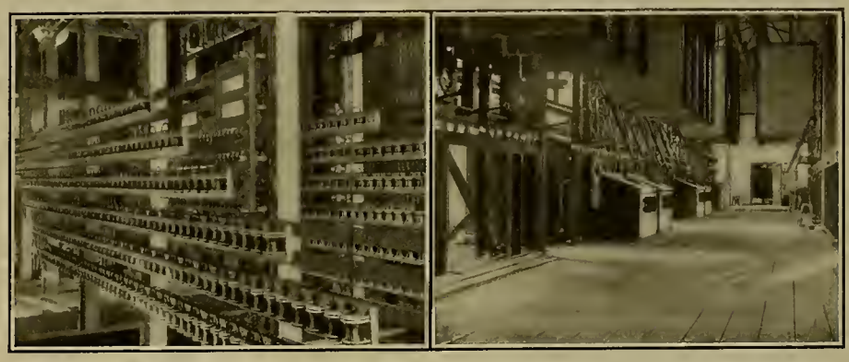
Everywhere on the Pacific coast that coal was formerly used for steam making, oil is winning its way, and the idle fleet of colliers in San Francisco bay and northern ports bear witness to the sudden and probably permanent cessation of such supply. Oil is cheaper, cleaner, more compact, and tends to solve the problem of cheaper manufactures on this coast, removing the onerous handicap of costly fuel and making possible many forms of competitive manufacture. With its great ally—electrical power—and a climate that makes every day in the year an out-door working day, there should be a great advance in Pacific coast manufactures and general industries. The $10,000,000 annual coal bill of California was cut last year to $5,000,000, indicating possibilities of economy and profit.

There is no standard for screens, though there manifestly should be. A 30-mesh screen means thirty wires to each lineal inch and twenty-nine holes. In wet concentration much coarser screens are used than for dry crushing.

Flume Tender's Cabin on the Colgate Flume

Spillway or Overflow Drain from the Colgate Flume

The center picture is a point on the Colgate flume known as Cape Horn, and illustrates some of the difficulties encountered and successfully engineered.



Part of the lightning arrester equipment at Electra.

The switch room at Electra; the 60,000-volt switches may be observed on both sides of the room.

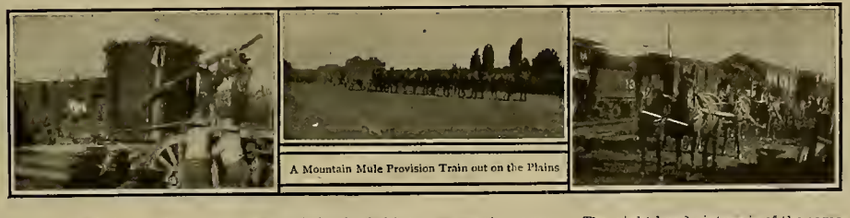
One of the Lakes in Alpine County Constituting Part of the Standard Company's Reservoir

The Hotel Standard at Electra for the Engineers and Attendants of the Power house

The Standard Company's high-pressure pipe line.

The Electra power house is on the bank of the Mokelumne.

Another view of the Electra power house with the Hotel Standard in the distance. The 1500-foot drop in the pipe line can also be observed in the distance.



A Mountain Mule Provision Train out on the Plains

The left-hand picture shows a transformer being loaded into a mountain wagon. The right-hand picture is of the same outfit showing the mules ready to start.

Scenes Along the Line of a Great California Electrical Power Company.

(See Page 346.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market St., San Francisco, Cal.

TELEPHONE, DAVIS 771.

ANNUAL SUBSCRIPTION:

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

Chicago Office (Telephone, Harrison 73).....737 Monadnock Block.
Denver Office (Telephone, Olive 733).....606 Mack Block.

J. F. HALLORAN..... Publisher.

San Francisco, June 28, 1902.

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Smelter Charges and Mine Profits.

The assay value of an ore is only one of the many items that enter into the final determination of the value of a mine. Even granted that the ore assayed is a true average sample (which often it is not) and that the quantities in sight have been fairly estimated by recognized mining methods, the jump from the assay value of ore in the ground to its final cash value in the bank is a long one. A short answer to some correspondence on this subject was essayed last week, but a more extended discussion of the subject is requested.

To make the matter more direct is given below a portion of a letter received:

———, June 1, 1902.

* * * * I have excellent shipping ore on the claims here, but do not like the idea of receiving 4½ cents less than market price (as per attached letter), especially as I prepay all freight charges, and also pay smelter charges.

I have smelter assays as follows:

No. 1..	Copper,	48 69%	Silver, 102.50 oz.	Gold,	1.30 oz.
No. 2..	"	30.74%	" 15.35 oz.	"	1.15 oz.
No. 3..	"	22.00%	" 3.20 oz.	"	.08 oz.
No. 4..	"	12.00%	" 2.40 oz.	"	.06 oz.

The quotations in enclosed letter are on Nos. 3 and 4.

Can you give me consistent explanation of why such a reduction is made (4½ cents) * * * * * *?

I have a 105-mile wagon haul to R. R., $15.00 per ton, and $15 40 R. R. rate to smelter, total $30.40 for freight, prepayment being required.

Following is a portion of the letter which our correspondent encloses received in answer to his inquiries from a Rocky mountain smelter:

* * * * Have your letter asking for quotations for ore represented by your samples recently sent us. In reply, will say we would be willing to receive this ore upon the following rates:

Pay for silver, 90% of N. Y. quotations date of assay.

Pay for copper, dry assay (equals wet assay, less 1.3 unit), at quotations for electrolytic cathodes, week previous to that in which assay is made, less 4½c lb.

Pay for all lime contained in the ore, if 10% or more, at 5c per unit.

Charge for treatment, f. o. h. our works, $6.00 per ton.

Charge for all silica contained at 10c unit.

Upon the above quotations, we would pay you for 75% of the value of the copper, making final settlement upon the quotation for copper ruling 120 days hence.

* * * * * * * * * *

Smelting companies are in business for profit quite as much as is the mine owner. While far from apologizing for apparent high charges by smelting companies and railroad companies, it is but fair to both the latter to remember that they also are pioneers in the development of mining regions, and have in many instances made it possible to work the mines at all. From crude ore at the mine to merchantable copper in New York is a long distance, in more senses than one, and for each step of the way a charge (including a profit) is exacted. The obvious remedy is to reduce the ore to matte as near the mine as possible. A sufficient number of developed mines would encourage the erection of a local smelter—even though the mine in question should not warrant it.

After paying all of the charges enumerated, a deduction of 4½ cents per pound from a 12-cent market price of copper does look aggravating and unwarranted at first sight, but a few figures will show that this particular charge will have to be met even with a matteing furnace at the mine and under the same ownership, since only the largest properties can stand converting works, and even then the copper must be shipped to the Atlantic seaboard to be refined and to seek a market. A 50% matte would make the cost for freight alone at $20 per ton amount to 2 cents per pound of copper, while charges for converting, refining and sales commission would make up the balance of the 4½ cents. In the present case the freight cost would even be greater. Dividing this greater cost, however, so as to make an all round comparison between a matteing furnace at the mine and a custom smelter several hundred miles distant, the probable saving for each item is indicated in the table below so far as can be done from incomplete data. The deduction of 1.30% copper as the difference between dry and wet assay is merely a very indirect way of deducting a loss of copper that goes into the slag—since the wet assay is the only one in practical use—while, as a matter of fact, the real loss in the slag is nearly always under 5%, and sometimes does not exceed .3 of 1%.

Various expenses reduced to cost per pound of copper in the ore.

Referring to sample No. 4 in our correspondent's letter, assaying 12% copper:

	Custom Smelter Ore.	Smelter at mine. Matte.	Difference.
Wagon freight	.0625	.0150	.0475
Railroad freight	.0642	.0154	.0488
Smelting cost	.0250	.0125	.0125
Smelting loss	.0130	.0040	.0090
Through freight (in addition to above), converting and refining charges, sales, commissions, etc.	.0450	.0350	.0100
Totals	$.2097	$ 0819	$.1278
Profit per pound			$ .0381
Profit per ton			9.14
Loss per pound	0.0897		
Loss per ton	21.37		

Similarly for the 22% ore we have:

	Ore.	Matte.	Difference.
Wagon freight	.0341	.0150	.0191
Railroad freight	.0350	.0154	.0196
Smelting loss	.0071	.0022	.0049
Smelting cost	.0136	.0068	.0068
Added through freight, converting and refining charges, sales, commission, etc.	.0450	.0350	.0100
Totals	$.1348	$.0744	$.0604
Profit per pound			$0.0456
Profit per ton			20.06
Loss per pound	0.0148		
Loss per ton	6.52		

Adding together the cost per pound of copper of wagon haul (.0150), local railroad haul (.0154), through freight and treatment charges (.0350), we have altogether $.0654 as the charge against the copper in the matte at the mine, and deducting this from market price, 12 cents, there remains 5.46 cents per pound. This is the matteing value of the copper. Gold that is carried in the matte is paid for at about $19.50 per ounce and silver at 95% of New York quotations. Now, if we deduct four-tenths of 1% from the copper for slag loss and 5% for silver oss we shall arrive at the true value of the ore when converted into a 50% matte. There is no deduction to be made for gold, as the recovery is generally better than the assay.

Taking assay of sample No. 4 we get value as follows:

	Per ton. (2000 lbs)
Copper at 12%, less 4%, at 5.46 cents per pound	$12.77
Silver, 2.40 ounces at 52 cents, less 10%	1.12
Gold, .06 ounce at $19.50	1.17
Value of one ton of ore reduced to 50% copper matte	$15.06

(N. B.—The assay value of the ore is $31.29.)

Deducting from the matteing value ($15.06) the cost of mining, smelting and general expenses, the remainder is the net profit per ton of ore. The matte can then be shipped to the nearest custom smelter with bessemerizing plant and by them converted into copper and shipped East to be refined.

The charge at the smelting works of 10 cents per unit for all silica in the ore is equivalent to an extra of $10 per ton of quartz, which added to the regular charge of $6 makes $16, and is based upon the extra expense over and above that of smelting a neutral ore. Assuming the cost of coke at the smelting works to be $6 per ton, the cost of limestone $1.50 per ton and that the slag carries 35% silica, the charge is a reasonable one. To smelt one ton of silica requires 65 ÷ 35 = 1.85 ton of lime (CaO) or approximately 3 7 tons of limestone ($CaCo_3$), and about three-quarters of a ton of coke. By reference to diagram No. 9, page 308 of the MINING AND SCIENTIFIC PRESS of June 7, 1902, the cost of smelting a ton of quartz with coke at $15 per ton and limestone at $2.50 per ton, making a 35% SiO_2 slag, is shown to be $27. The saving on three-quarters of a ton of coke at the difference in price is ($15 — 6) × .75 = $6.75, and in like manner on 3 7 tons of limestone the saving is $3.70—a total of $10.45, which deducted from $27 leaves the cost at $16.55. Since it requires about two units of lime (CaO) to flux one unit of silica, the lime credit is worth but 5 cents per unit as against 10 cents debit for silica.

It is to be noted in connection with this subject that custom gives way to local requirements and that nearly every locality now becomes a law unto itself. In the letter written by the smelter manager to our correspondent it will be noted that he stipulates: "Charge for all silica contained at 10 cents per unit." That applies in that particular case, and bears hard enough on the output, while in some localities such a charge would be prohibitive. In Colorado the regular smelter schedule calls for 10 cents per unit for all over 40%. Manager Carpenter of the Golden, Colo., smelter has not been charging any penalty for siliceous ores (purely because of local conditions referred to), but states that after the 15th inst. on low grade ores his charge will be "$5.50 per ton, f. o. b, Black Hawk or Idaho Springs, Colo., with penalty of 5 cents per unit for silica over 50%." Now, while this appears much better than the regular Colorado smelter schedule of 10 cents per unit for all silica over 40% (and infinitely more favorable than the charge in the smelter superintendent's letter published above), yet in the cost of the Golden, Colo., smelter there will result dissatisfaction among local ore producers, because most of the milling ores of Gilpin county carry at least 50% silica (some as high as 75%), and the silica charge noted, though by comparison appearing extremely favorable, may run the smelter charges there up to $7.50 per ton, with the probable result of sending all that class of ore to the stamp mills, instead of to the smelter.

GOVERNMENTAL mining statistics at times run into a variety of things, an unusual form being manifested in an elaborate report received from the Queensland, Australia, Mining Inspector, wherein he shows that in that region during the past year "50,000 oz. of gold have been obtained per life lost." During twenty years there "the general result has been the loss of a life for 41,280 oz. gold obtained."

INERTIA is not a force. It is merely a term expressing the inability of matter of itself to stop or start. A body at rest will remain at rest, because of inertia, unless started by some force. A body in motion will remain in motion because of inertia, unless stopped by some force. A body once started in motion will continue in motion forever, unless there is some cause of loss of the original energy.

IN noticing the 42nd anniversary of this paper's existence, the editor of the Bingham, Utah, Bulletin says he "set type in 1860 on the MINING AND SCIENTIFIC PRESS—the first year of its existence." And yet they say printers and newspaper men are not long-lived! Here is a man who set type on this paper in 1860, and is in 1902 weekly publishing a fine paper!

ALL subscribers are urged to bind in the five-page index in this issue with the twenty-six numbers of the volume that ends to-day. The index is a great time-saver in finding an article or item when wanted.

Concentrates.

A DRUM of liquid chlorine should treat about fifty tons concentrates.

A 3-INCH Manilla rope, 500 feet long, will weigh 1485 pounds. One wire rope will outlast 3 hemp ones.

THE temperature of a strong coal fire is from 2000° to 2500° F.; the temperature of a kerosene lamp from 1600° to 1800° F.

COLORADO law provides that wages or income to the amount of $60 per month are absolutely exempt from attachment for debt.

WITH the piston speed 100 feet per minute, and the plunger 4 inches diameter, a double-acting pump would discharge 7¾ gallons per minute.

THE general rule in electrical engineering may be summed up: "Alternating current for transmission; direct current for local distribution."

COKE for the Le Roi, B. C., smelter costs $6 per ton, delivered. One-fourth of a ton of coke is required in the smelting of one ton of Le Roi ore.

KLONDYKE gold is usually about 800 fine, the remainder being silver, with an occasional trace of baser metal. The purest gold on the coast has been found in Tuolumne Co., Cal.—978 fine.

A DITCH 30 inches wide at surface, 30 at the bottom, gives average width 33 inches; average depth, 10 inches, area of a cross-section is 330 square inches; 2.29 square feet; surface velocity per second, 1.25 feet; theoretical discharge would be 2.86 cubic feet; deducting 20%, leaves 2.29 cubic feet per second.

THIRTY THREE and one-third inches, or 2.78 feet,=1 vara; 5000 vara square, or 4425 acres,=1 league; 1000 vara square, or 177 acres,=1 labor; 5645.37 square varas, or 43,560 square feet,=1 acre; 208.71 feet, or 75.13 vara square,=1 acre. To reduce varas to feet divide by 0.36. To reduce square varas to acres, multiply by 0.000177.

WHEN sharpening and tempering drills leave the sets on the forge until all are finished, then heat the bits cherry red, but not the body of the steel; dip in clean water, moving slowly down, then out, leaving heat enough in the body of the drills to toughen the bits by starting temper to show color. Check color by cooling in slack tub.

AT sea level 1000 cubic feet of air compressed to 80 pounds in two stages develops 1000x.137=137 H. P. at an altitude of 10,000 feet above sea level, the volume to be equivalent at this pressure must be 39% greater, or 1390 cubic feet. At that altitude the H. P. factor for compression to 80 pounds is .113 per cubic foot; so 1390x .113=157 H. P. Hence 20 H. P. more than at sea level is reuired for the same effect.

IT doesn't add anything to the desirahllity of a mining stock to make it non-assessable. That non-assessable provision is usually paid for at a high rate hy the owner. Should the mine prove valuable the vendors who insure the non-assessable feature get the higgest part of the profit. If the property prove profitless what good is the non-assessahle feature? If (as is generally the case) more money is needed, how can stockholders he compelled to contrihute or quit if the stock he non-assessable? The argument lies in favor of assessahle mining stock, every time.

ONE mile street railway track would take 157½ tons of 100-pound rail, that is 9-inch girder rails, 60 feet long, weighing 100 pounds per yard; 176 joints, with holts and nuts; 2112 ties, spaced 2½ feet on centers, or 24 to a 60-foot rail; 4224 tie plates; 8448 spikes, 4 to a tie, or 12,627 spikes, 6 to a tie; 1056 tie rods, spaced 5 feet apart, double nuts each end; 176 single-rail bonds, or 352 double-rail bonds. The rails would cost $4714, the joints and holts $1056; the ties, $1056; the tie plates, $844.80; spikes, $160; tie rods, $528; rail bonds, $176; freight not counted.

THE description of a mining claim in a notice of location hy metes and bounds, with reference to stone monument erected at the four corners and at the center of the east and west lines of the claim, is sufficient, under statute 1897, requiring a description which defines the exterior boundaries as they are marked upon the ground, and such additional description reference to some natural object or permanent monument as will identify the claim, especially as against a subsequent locator who finds the bedding and tools of the previous locator upon the claim, and an employee holding possession for them.

FROM consumption tests the Santa Fe Railroad Co. figures comparative costs of coal and oil for fuel: 25 passenger and freight engines on a 30-day run used 2077 tons of oil and traveled 87,063 miles, or 41.9 miles per ton, or 3500 miles per month per engine. Oil at $1.33 per harrel would at this figure cost 14.4 cents per mile. Twenty-five passenger and freight engines (same days, same track and same condition), hurning coal, cost 23.2 cents per mile. The oil was 15° Baume. This showed a saving for oil of 38%. The experiment was tried with coal at $6.65 per ton. By further experiments the Santa Fe figured that oil at $2 a harrel is equivalent to coal at $6.60 per ton.

IF the steel is too mild for tool steel it can be improved for such purpose hy heating to a red heat, and coating it with pulverized ferro-cyanide of potassium, same as applying horax as a flux. Reheat to a red heat and sprinkle powder of same material over the same, and then plunge in cold water to harden. Draw temper to suit. If this does not produce the desired degree of hardness, add to 10 gallons of water ½ pound ferro-cyanide of potassium and 10 pounds of chloride of common salt. When entirely dissolved the bath is ready to use. To drill chilled castings make the drill as hard as it will stand, and then use muriatic acid on the drill. Keep the drill sharp all the time.

IN running levels for a ditch line, allowance should be made for the curvature of the earth. The line of the axis of the level telescope is not a level line, it is not parallel to the surface of the earth, but is tangential to it. If such a line be continued a distance of 6 miles, it would he 20 feet 6 inches too high at the end, and a ditch run by it would have a down grade towards the point where telescope is. The line would be horizontal, but not a sea level, i. e., parallel to the sea surface. For 1 mile this difference, due to curvature (and refraction), is 0.572 feet; 5 miles, 14.3 feet; 10 miles, 57.2 feet; 50 miles, 1429 feet, and for 100 miles, 5717 feet. This difference increases as the square of the distance; the refraction, which causes the object to seem higher than it is, is about one-seventh the curvature and should be deducted from the same.

FOR purity of water the following tests may be employed: Organic impurities may be detected by dissolving a lump of loaf sugar in the water. Let it stand in a bottle tightly corked (better glass-stoppered) two or three days in the sun. If it becomes turbid it has organic impurities; if it remains clear it is safe to drink. If the water contains iron, boiling it with a little nutgall will show the presence of iron if water turns black or quite dark. By adding lime water, free carbonic acid is shown to be present by the formation of a precipitate, further proof of which is obtained by adding hydrochloric acid, which should show evolution of gas. The presence of lime is told hy adding two or three drops of a solution of oxalic acid, then blow through the water (using a glass or other tube), if present, the water will turn milky. To test for hardness of water, dissolve soap (castile preferahly), in alcohol; add a few drops of this to the water, if hard it will turn milky, if soft it will remain clear.

IT is not correct to assume that when a chain gears into a toothed wheel all the teeth entering the chain are simultaneously in action. No matter how accurately a chain and wheel may fit when new, the moment a strain is brought to bear on the chain, and the wheel begins to turn, the pins hegin to bed themselves into their hearings, producing at once a lengthening of the pitch. The amount of this bedding or seating may he infinitesmal in each joint, hut it is sufficient to destroy the simultaneous bearing on all teeth. The action between chain and wheel tends to wear the chain long and the wheel small, and results in one tooth doing all the work at one time. Unless the wheel face is kept well luhricated more perfect action is secured hy the type known as the roller chain than hy the ordinary solid joint chains, because the release of the outgoing link and the slipping hack of the remaining links is accomplished with less jar and with less wear on the external part of the chain joint hy rolling than hy sliding.

IT is customary to measure all foundation and dimension stone hy the cubic foot, and no wall less than 18 inches. In stone work, corners of huildings are measured twice, and arches are counted solid from their spring. One cord of rough stone, 3 hushels of lime and 1 cubic yard of sand will lay 100 cubic feet of wall. When suitable stone cannot be obtained for engine foundations, concrete composed of 1 part No. 1 Portland cement, 2 parts coarse sand and 5 parts stone broken to size of egg coal, or coarse gravel may he substituted for stone. Turn and mix while dry, twice. Turn and mix with water, twice, and place. If the concrete is to be richer, use more cement. Brickwork is generally measured by the 1000 brick laid in the wall. In consequence of the variations in size of common brick, no rule for volume of laid brick can be exact. The following scale is, however, a fair average: Seven common bricks to a superficial foot for a 4-inch wall; fourteen common bricks to a superficial foot for a 9-inch wall; twenty-one common bricks to a superficial foot for a 13-inch wall; twenty-eight common hricks to a superficial foot for an 18-inch wall; thirty-five common hricks to a superficial foot for a 22-inch wall.

CALCULATE that boilers operated at 5000 feet above sea level require 16% more air (or draft) than when used at sea level, and ahout 35% more at 10,000 feet elevation. The capacity of a flue or smokestack is determined by its height as well as hy its diameter. In return-flue hoilers the longer the flues, the larger would be their diameter. When selecting return tubular boilers, where cordwood is to be used, let the diameter be small in proportion to length, but when coal is to be fired the diameter should he large in proportion to length of shell, as the flame is so much shorter with coal than with wood. See that the flues do not come nearer than one-fourth of the shell diameter from the top of boiler, and that all flues are not less than 1 inch apart. Also require a man-hole below the flues and a man-hole above the flues. Have a regular time for cleaning the soot from flues of hoilers, and sediment and scale from the inside of hoiler; neglect of such cleanings means waste of fuel and decay of hoiler. An exhaust heater heats the water fed to the hoiler hy means of exhaust steam from the engines; in addition to saving from 5% to 15% fuel it avoids the damage otherwise done to the boilers feeding cold or only warm water to them. Records for highest fuel economy in boilers have been often made by lnternally fired hoilers. A water-jacketed fire-hox is more conducive to economy than setting in brickwork. Radiation or waste of heat from a hoiler can be prevented by coating with non-conducting material rather than by brick setting, besides incurring less cost and occupying less space.

ATTEMPT to state whether the copper ore described is or is not susceptible of satisfactory leaching, would manifestly be inaccurate. J. W. Neill of Salt Lake City, Utah, patentee of a process for leaching copper ores, uses as a solvent sulphuric acid gas, which has been tested on a working scale of two ton charges on ores from Butte, Mont., and from these got a result of 96% saving of the copper. The ore described might be leachable by that method; that could be determined by suitable tests. Copper present in the ore as metallic copper might not he soluble (commercially) in any of the solvents in use; so that if there were a large percentage of the copper present in the ore in the form of metallics it would have to be saved in some ether way, possibly by concentration of the tailings after leaching. Oxides, carbonates, silicates (and this also includes roasted ores), readily dissolve in sulphurous acid, and from the solution obtained copper may be precipitated by boiling the filtered solutions. Lime, magnesia, and to a less extent alumnia and iron (in the order named), are objectionable, as they consume sulphur, and in part also adulterate the copper precipitate. The question of the amounts of these materials which can he commercially suffered in a leaching ore is one of considerable latitude, based on the contents of the ore in copper and the costs of sulphur. If the copper ore deposit were near a deposit of pyrites, which would supply the necessary sulphur at a reasonable cost, the presence of the lime need not he a barrier to the successful leaching of the ore. If the ore is located far from sulphide ores, and the sulphur has to be taken to the locality in the shape of brimstone, the question becomes more complicated.

IN Guerrero, Mexico, free milling gold ore is treated by the old Spanish method in arrastras and the tailings for treatment by modern machinery later on. The total cost of a 10-foot arrastre does not exceed $35. Their construction is simple. Near a stream of water a circular hole, about 3 feet deep and 12 feet in diameter, is dug. A layer of clay is placed on the bottom, in which is evenly imbedded flat stones—interstices being carefully filled up with clay. Around this hole timber, or, more preferably, stone is built, clay being filled into the cracks. Four wood posts are sunk into the ground 16 feet apart, on which cross pieces rest. In the middle an upright wooden shaft is placed with two iron pins in center, top and bottom. A cross piece passes through the shaft 3 feet from the floor on which are hung two or more stones as flat on the hottom as possible, weighing ahout 600 to 800 pounds each. These are the metlapiles or grinders. Another cross piece passes through the shaft a few feet higher, on which the animals—horses and mules—are hitched. The ore is crushed about the size of a bean and placed in the arrastra—100 pounds at a time, 100 to 1000 pounds heing sufficient for a 10-foot arrastra. When it has been ground almost to a pulp, quicksilver is added in quantity according to the richness of the ore. One-ounce gold to the ton will require half a pound—the clean-up enabling the operator to judge how much is necessary—the quicksilver showing whether it is sufficiently charged or not. When the ore is ground fine enough to pulp, the water is turned on and mixed for an hour, when it is turned off and gradually emptied, running through a 10 to 12-foot sluice box, into a 3-foot square box. The lama or pulp is then placed in a rocker, and the quicksilver is squeezed through a buckskin, and what remains is afterwards retorted and smelted into bars. If the ore is free, 60% of the gold will be saved.

STATES and Territories having laws requiring discovery shafts 10 feet deep, or deeper, if necessary to reveal a well-defined vein or lode, are Arizona, Colorado, California, Montana and New Mexico. States in which a shaft must he sunk only deep enough to reveal a vein or lode are Idaho, Nevada, Oregon, Utah, Washington, North Dakota, South Dakota and Wyoming. In every State the locator must define his claim boundaries hy stakes, which may be either wood or stone, and state in the location certificate and notice the name of the locators, a description of the property and date of location. Courts hold locators to the strict letter of the statute, and a failure to comply with each and all of them, in case of adverse suits, is almost always fatal. Especially should the stakes marking the boundaries be always set, and witnesses should be obtainable to prove, in case of necessity, that they were set. A failure to mark boundaries is universally held to invalidate a location. The width of claims allowed by law in different States is as follows: 600 feet in Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming. North Dakota and South Dakota allow 300 feet as the width of claims. Colorado allows 300 feet in part of the counties and only 150 feet in others. In each State miners are allowed in each properly organized district to make any regulations regarding claims not in conflict with State or United States laws. In Wyoming, Nevada and California district organizations and regulations are common. In most other States and the Territories they have gone out of business, relying upon the State and United States laws. In Colorado there are no district laws and regulations in use. As a rule they are not desirahle, though where there were districts far removed from the centers of population, and the State laws favor district organizations, they may be desirable or necessary.

Electric Power Plants of the Pacific Coast.*

NUMBER II.—CONCLUDED.

For the best efficiency the wheels must run at half the spouting velocity of the water, which in this case is as high as 18,000 feet per minute. In other words, the peripheral speed of these water wheels amounts to 9000 feet per minute. They are 11 feet in diameter and run at 240 turns. Two wheels each of 1000 kilowatts capacity are attached to each generator and five sets of wheels and generators are installed. From the power house the lines lead through hill and dale, through the city of Stockton on to the little town of Mission San Jose, along the shores of San Francisco bay, a distance of 100 miles from the power plant. At this point the lines diverge north and south and are here controlled as a center of distribution for the system. Thence they run north about 28 miles to Oakland and south to San Jose, around the bay and up north to San Francisco, making a total transmission distance of 154 miles—34 miles farther than was originally contemplated, for the reason that originally it was intended to cross the hills direct to Oakland and cross the bay direct to San Francisco, but permission could not be obtained from the Government to erect poles and cross the 10-mile stretch of navigable water between Oakland and San Francisco, whereas the expense of submarine cables would have amounted to as much as the remaining expense of the entire line—the change in the distance and the lengthening of the line being made further justifiable by the fact that all around the bay are towns, large and small, which form satisfactory customers for the power. The plant is now nearing completion, but, as I have already said, these men who have invested in the Standard Electric Co. have faith enough in the engineering that they are doing to be so sure of success that they are unwilling to experiment with their customers, and only enter upon their period of regular operation after they have satisfied themselves with their plans and their construction work. In Oakland, San Jose and San Francisco they have added, as an additional safeguard against interruption of service, storage battery plants, and have installed for charging these motor-generator sets capable of being used in such a manner that, should accident occur along the line, both the alternating current and direct current service can be maintained by means of the batteries. This company is entitled to much of the credit for the exceedingly long-distance transmissions on the Pacific coast, and while it may be unfortunate for their immediate glory that other plants are in operation before theirs is ready, their customers in later years will have reason to thank them for the care with which they have taken every step. Since their plans were laid out and the work begun, the Bay Counties Co. found that they could make a contract with the Folsom Co., who supply Sacramento, and whose plant was deficient in capacity. Accordingly they built to that city a line 60 miles in length, which they operate at 40,000 volts, supplying current in conjunction with the 10,000-volt plant 20 miles away at Folsom, the two plants, one at Colgate, 60 miles from Sacramento, operating in parallel with the Folsom plant, 20 miles from Sacramento. Later on the Bay Counties Co. built, and is now operating, a line 152 miles in length from their plant to the city of Oakland. To reach this city they had to cross the navigable straits of Carquinez, through which the deep-water grain ships go from San Francisco bay to the principal coast grain shipping port of Port Costa. Fortunately these straits are bordered with high hills. At these hills they erected towers and stretched their cables with a span exceeding 4000 feet, effecting one of the most remarkable feats that has ever been attempted in long-distance power transmission. As the sub-stations and lines to this point belonging to the Standard Electric Co. were ready for operation, this company has bought a large amount of power from the Bay Counties Power Co., which they transmit south to Mission San Jose and thence to Stockton, San Jose and up around the bay as far as Redwood City, effecting a total transmission for the Bay Counties Co. of 198 miles to San Jose, 200 miles to Redwood City, and 218 miles to Stockton. These distances are met successfully in every day working, and the interruptions in supply have at no time been serious, nor has there at any time been any reason to feel that the work is at all of an experimental character. Up at Colgate their generators run day and night, supplying power to these distant points, with the result that the company is successful, not only from an engineering point of view, but financially successful, with the success that has given confidence and strength to all electrical transmission securities along the Pacific coast. These plants operate lights, mines, railroads, flour mills, and in every operation have given such service to their customers that, in spite of the fact of recent discoveries of large quantities of fuel oil, their only difficulty is to find enough power to supply the demand made upon them.

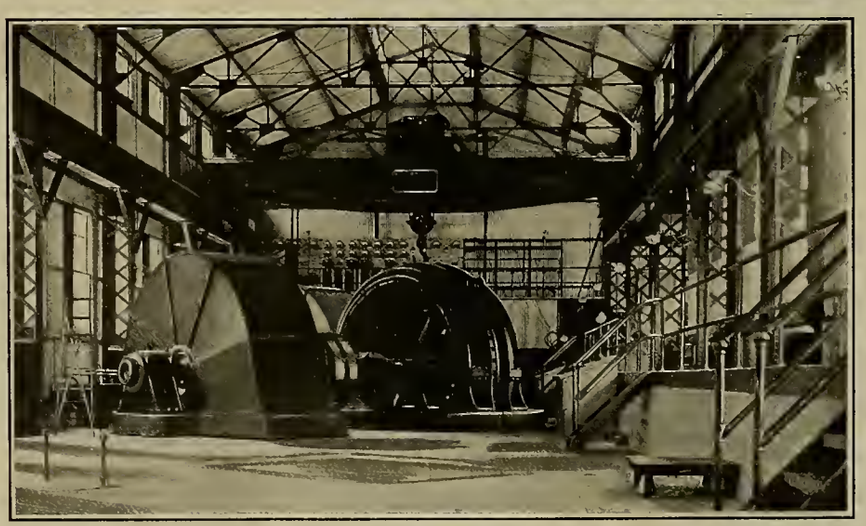
I might go further and describe the power plant of the Big Creek Co., whose lines run along the seashore and operate almost continually in a sea of fog, or that of the Fresno Co., which was the first, with the exception of that at the Chollar mine at Virginia City, Nev., to operate at a head exceeding 1000 feet, or give a description of the plant at Bakersfield, where electric power is preferred to a ditch system for irrigation; but in describing these plants I would only be repeating what has been said concerning them, or repeat descriptions which, on a larger scale, would apply to the two plants that have just been mentioned. Instead of going over these in detail, I prefer finally to call your attention to the collection of plants feeding into the city of Los Angeles. In this region was the first really long-distance transmission plant, that at Pomona, a single-phase lighting plant, where the power for lighting was transmitted a distance of 28 miles at 10,000 volts. From this beginning one plant after another has been installed, until finally the plant of the Southern California Electric Co. was built, with a transmission of 80 miles at 33,000 volts.

*Condensed from a paper read by F. A. C. PERRINE before the New York Electrical Society.

engineer. No rule of thumb principles is applicable. The men encountering these problems must be and have been men with independent minds—men capable of realizing the difficulties and not frightened by them. They are frontiersmen—undaunted, unafraid and resourceful.

In addition to Prof. Perrine's remarks it may be said that the Colgate development has been most notable on account of the difficulties in its construction and the long range of its current-supplying network of transmission lines. The Colgate installation is on the north bank of the North Yuba river, where the old Missouri trail crosses it. Seven miles up stream the water is impounded and let from dam to power house in a wooden flume which consumed 8,000,000 feet of spruce, pine and cedar. The flume has the delivering capacity of 23,000 cubic feet per minute, pouring the water into the reservoir on top of the hill, at the foot of which the power house is located, 700 feet below. The water has considerable head on when it finally flows into the turbines, nearly four times as far below the water level as the Niagara turbines. The success of this and of similar plants like the San Joaquin one (which has a 1400-foot head), lies largely in the Californian practice of using a comparatively small stream of water with great head, getting as much power out as from a larger stream with a small head.

An interior view of Colgate, showing the electric generators and turbine casings on the right and the transformers on the left.



The Interior of Electra. The machines are placed diagonally in order to minimize the angle in the pipes bringing the water under 1500 feet head.

Shortly after this plant was constructed a consolidation of interests centering in Los Angeles was made, and now there is there daily effected parallel running to a most remarkable extent. Alternators of both revolving field and revolving armature types and of different makes are running in parallel and supplying together power for railroads and lights in conjunction with steam-driven plants, without a thought of such troubles as are supposed to come from the coupling in parallel of steam engines or of engines with water wheels, and yet there is nothing that has been done to effect this successful operation which can be considered remarkable for ingenuity—simply the plants have been well engineered, well installed, and are well operated. After all, this sums up everything that has at all attracted your attention in connection with work I have been describing. The problems of the Pacific coast are problems for the trained

The power house, built to permit of enlargements as required, contains seven units in all, aggregating 15,000 H. P. in 3000 H. P. generators and four of 1500 H. P. each. After leaving the generators in the Colgate power house at 2400 volts the current goes through the step-up transformers and comes out with a 2% loss at a potential of from 40,000 to 60,000 volts, and occasionally, during bad weather, at 80,000. It is stepped down again, on reaching its

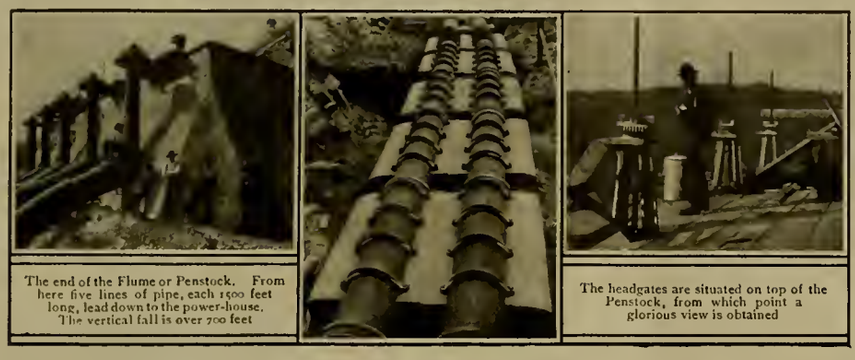
destination, to the potential required for the local service, which varies from 110 to 5 volts.

Losses are an important feature of any transmission system, and one on which the efficiency of the line largely depends. Working a line with such pressures as are here employed the losses are comparatively insignificant; 1000 actual H. P. sent from the power house at Colgate, 220 miles, to San Francisco, should lose only about 250 H. P. in transmission, netting 750 H. P. at the receiving station. T. Commerford Martin estimates the losses in current as follows: In the generators, 6%; step-up transformers, 2%; regulation and line losses, 15%; and 2% again in the step-down transformers, thus making a total of about 25%. In the report of the company is shown the following financial table:

1901—	Gross Receipts.	Expenses.	Net Profits.
April	$13,913 21	$4,466 35	$ 9,446 00
May	16,195 76	4,590 86	11,604 90
June	18,219 78	4,217 11	14,002 67
July	20,903 46	6,674 15	14,229 31
August	24,185 70	6,033 51	18,152 19
September	25,463 52	6,864 59	18,598 93

In a development of this character it is impossible to get at exactly the cost per horse power of plant installed, and it may be said that so far as the hydraulic and electric installation is concerned, no accurate estimate of the cost can be given for the total horse power, including land, water rights, buildings, machines and accessories complete for operation. The pole lines, because of some of the expensive engineering features connected therewith, can be roughly estimated at approximately $20,000 per mile. Such data as can be given regarding the Colgate line shows that the wire used varies from ¾-inch diameter down to No. 1 B. & S. The line loss between extreme points of production averages about 12%, i. e., C^2R loss.

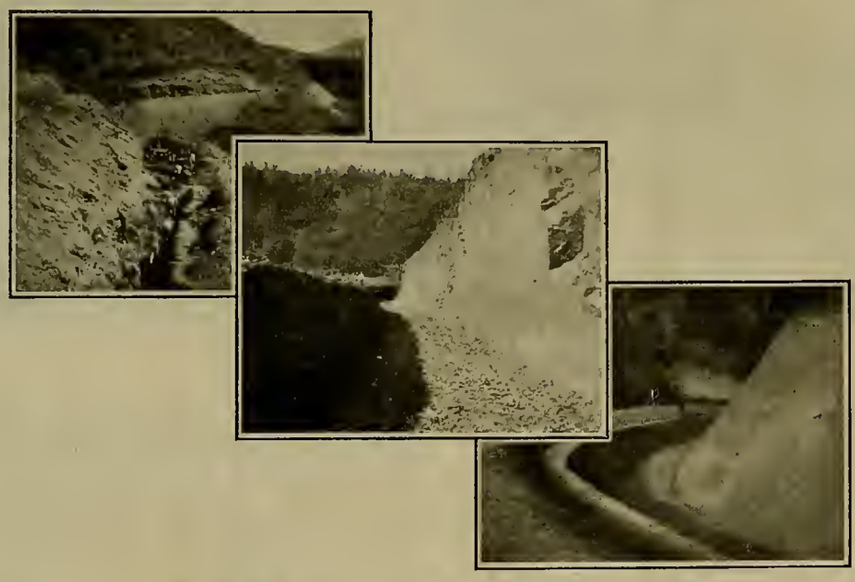
The flume which conveys the water to the power house has a watershed 532 miles in area to draw from, and is 7 feet wide and 6 feet deep for a large part of its length. From the flume itself the water drops from the power house through five separate steel and iron pipes 30 inches in diameter, and after passing through the gate valves impinges upon the turbine wheels, which are driven at high speed and direct connected to the generators. The Carquinez span, where the cables cross the Carquinez strait 200 feet above the water, is 4480 feet in length—three times the length of the Brooklyn bridge. The steel towers which carry the shore ends of the cable are noticeable viewed from the engineering standpoint and are also beautiful pieces of lattice work. The cables are four in number, made of stranded plow steel. Insulators of the Locke type are used on the poles. The company experimented for some time to try what effect rain would have upon them. The result of the experiments was that the insulators permitted the water to run off the top in a steady stream at no voltage, while at a pressure of 40,000 volts the water was so electrified as to be sprayed off at an angle of about 10°. One of the transmission lines is built of aluminum and measures a scant ¼-inch diameter, having a total length of 61 miles, running from the power house at 40,000 volts; another line similar to it goes in a northwesterly direction 30 miles to Oroville, where power is delivered to two sub-stations, which in turn supply energy for the gold dredgers of the Feather river.



The end of the Flume or Penstock. From here five lines of pipe, each 1500 feet long, lead down to the power-house. The vertical fall is over 700 feet

The headgates are situated on top of the Penstock, from which point a glorious view is obtained

The center picture illustrates the method of anchoring the pipes in massive concrete piers.



The upper left-hand picture is of the ditch under construction. The lower right-hand picture is of one completed. The center view is of a point where cutting through solid rock was necessary.

A 120,000-volt arc between the needle points of a spark in the testing room at Electra.

THE experiments of the Santa Fe Railroad Co. with oil on its road beds have been successful. The 1200 miles between Point Richmond, Cal., and Albuquerque, N. M., are well oiled. The longer the oil is used the less the amount which is necessary. When a portion of the track has been well oiled it is found that the surface maintains its hardness for several months and that the next time it only requires about half as much.

Saving Gold From Black Sand.

Written for the MINING AND SCIENTIFIC PRESS.

There have been many attempts made to recover the gold from the black sand found on the beaches along the Pacific coast, but few have been able to save much of the gold and none have been able to save all of it. Most of the attempts have been failures and none have paid more than ordinary wages at the best for any length of time.

Men have thought the problem over and over, for the man who at last solves the riddle will have an almost unlimited amount of material awaiting him. There have been all sorts of sluice boxes, rockers and long toms tried, various shapes and arrangements of riffles and burlap, carpet and plates, but none have been successful enough to pay more than ordinary wages when rich sand was worked, and none have been able to handle the sand on the large scale necessary to make big money out of it.

Machines having magnets to separate the iron or magnetic portion of the sand from the rest have been made, but they have found that only about 10% of the black sand is magnetic. While running the sand through these machines some of the flakes of gold and the particles of gray sand that happen to get caught between the grains of magnetic sand and the magnets are taken out with the magnetic sand, making the separation unsatisfactory.

The sand has to be screened first to get all the gravel and pieces of wood out of it. If the sand only averages $1.50 per ton, with this slow method of handling, it would cost more than the value of the gold in it, even if it were possible to get the gold afterward by sluicing.

The black sand found in the bottom of the sluice boxes in hydraulic mines is almost all strongly magnetic, but the black sand found on the beaches along the coast does not resemble this sand much. The magnetic portion of the beach sand is only about 10% of the whole amount of the black part of the sand, so eliminating the magnetic part of the sand does not reduce the specific gravity of the whole much, and does not make any appreciable difference in sluicing afterward.

The great obstacle that cannot be overcome in working the sand by sluicing is that the gold is so thin and light that it is carried more easily by the water than are the grains of sand, which have so much more body to them, and the sand instead of the gold settles between the riffles and packs hard. If the head of water is increased, or more slant given to the sluice box to keep the sand from packing, the gold goes through all the more readily.

If amalgamated plates are used to catch the gold the mercury and what little gold caught is scoured off the plates by the sand. If only $1 in gold is caught by the plates, while 2000 pounds of heavy sharp sand is washed over them (specific gravity about 4.54), the effect can be easily judged without a trial.

If Brussels carpet or burlap is laid on the bottom of the box to catch the gold the carpet or burlap soon gets a coating of sand so solid and smooth that the rest of the sand runs along the top without disturbing the sand beneath which is so firmly held by the threads of the material. The gold is so light that if it is not thoroughly wetted before it goes into the sluice box the chances are that it will have a small air bubble attached to its side and rise to the top of the water and float off without sinking at all. With such light gold as that there is little chance of saving it.

There is one way to save the gold and that is by the cyanide process. The gold, being so light and thin, is in the best possible form for cyaniding. The cyanide process is capable of handling a large amount very cheaply and without a large outlay of money for a plant. The thinness of the gold makes a weak cyanide solution very effective, and a weak solution must be used to keep the iron of the sand as much as possible from being dissolved.

Where the cyanide process has been tried on black sand and has not been a success, the reason is that zinc shavings were depended upon as the precipitant and they failed because the small amount of gold in the sand and the large amount of iron dissolved by the solution prevented the proper chemical action of the zinc shavings upon the cyanide solution, the iron which is dissolved in such a great amount in the solution accumulating to such an extent after the first leaching that it prevents the precipitation of the gold.

Iron will precipitate zinc from an acid solution, and although it will not precipitate it from a cyanide solution it has the property, if there is much iron in the solution, of keeping the zinc from going into the solution to replace the gold. And it is this reason that has prevented the successful working of black sand. The writer is personally acquainted with some gentlemen who spent over a year experimenting with a black sand mine in Oregon. The sand averaged a little over $2 per ton and they had a back beach covering ten acres and nearly as much more near by.

They used zinc shavings in every experiment, and say that if the sand was cyanided in the laboratory in large glass jars the gold dissolved easily and they were able to precipitate it afterward with zinc shav-

ings and recover the gold. But when they put up a cyanide plant and tried it on a large scale they could get but part of the gold the first time the solution was used, and the second and third times they used the solution they could get no precipitate on the shavings, the solution even seeming to dissolve the first precipitate, leaving the shavings bright and clean again.

The difficulty of precipitating the gold is solved by the use of a current of electricity. The electric current will precipitate gold from the solution with ease and also throw the iron out of the solution in the form of a gray powder, which can be strained out of the solution, and thereby at the same time save the gold and eliminate the chief cause of the trouble. By keeping the amount of solution as small as possible black sand can be worked in this manner cheaply.

A leaching vat holding fifty tons of sand could be worked with but ten tons of solution if the solution was allowed to percolate upward slowly through the sand and then pumped to a small tank a little above the vat as it accumulated above the sand, and then run through a pipe to the bottom of the vat, where it would again percolate through the sand, making a continuous flow until the gold was all dissolved. The solution being weak would necessitate but a small amount of wash water to displace it effectively.

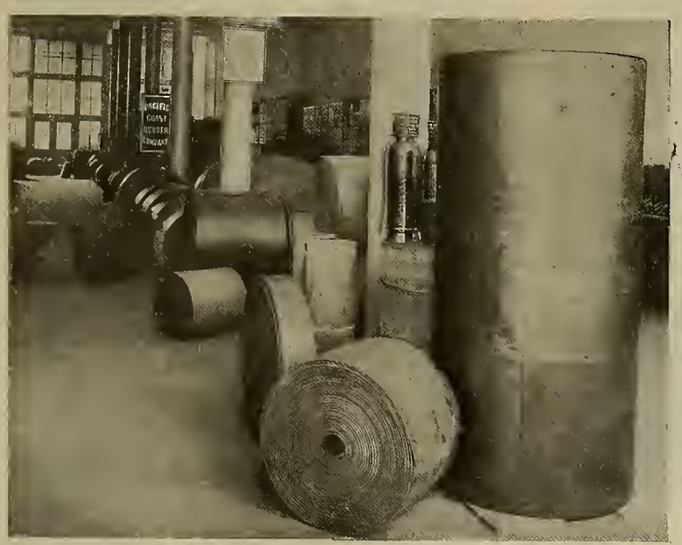
Nearly all the beach sand carries platinum and iridium in the form of grains like the rest of the sand, and they can be saved by a concentrator, making an additional profit for the plant.

Electrolytic Lead and Oxides.

At the recent meeting in Philadelphia of the recently organized American Electrochemical Society, P. G. Salom read a paper describing a process of his invention for electrolytic lead reduction which is in operation at Niagara Falls. The principle lies in the use of lead sulphide as cathode in an acid solution, the hydrogen cation forming with the sulphur gaseous hydrogen sulphide, and thus reducing the lead sulphide to lead in spongy form. The form and construction of the cells used were described and the difficulties discussed which had been encountered. The principal difficulty was that the reduction was not complete, and the degree to which the ores are reduced varies without apparent reasons. It was stated that at present 92% to 95% of the sulphide is reduced. Another difficulty is that the workmen's eyes are affected in the operation of the process. Two pounds of lead are produced per horse-power hour, forty-eight cells in series being electrolyzed at 130 volts. Specimens were shown of spongy lead, compressed sponge, litharge and other materials made by Mr. Salom's company. Owing to the spongy form, the material is very readily transformed into litharge. The company intends to take up later the manufacture of storage battery plates. — Journal Franklin Institute.

A Huge Leather Belt.

The accompanying illustration shows the interior of the warerooms of the Pacific Coast Rubber Co., at 453 455 Mission street, San Francisco. This company has just filled an order from the Vance Redwood Lumber Co. of Eureka, Cal., for what is believed to be the largest leather belt sold in California. The engraving shows the great roll on the right. It is a 3-ply belt, width 72 inches, length 117 feet, weight 2700 pounds. It is a Hoyt Short Lap leather belt, there being no sectional pieces over 4½ feet long. It is made from pure oak-tanned butts. The leather was cut from the heart or solid part only; no part of the shoulder was used.



A Large Leather Belt.

Concentrative Experiments on Antimonial Silver Ores.

Written for the MINING AND SCIENTIFIC PRESS by CHAS. M. FASSETT, M. E.

No one who has not made concentration experiments on antimonial silver ores can appreciate the disappointment they usually cause both to the miner and metallurgist. A highly siliceous ore carrying 15 to 20 ounces of silver, a trace of gold and very small quantities of antimony, copper and lead and 8% to 10% of iron pyrites, located 100 miles from a railroad, is a pretty hard proposition to figure a profit out of, even if developed in considerable quantity. The chief hope is in concentration, and if repeated experiments along the usual lines yield a saving of only 20% to 25% of the values, one is likely to give up in disgust. In order to get the hard, siliceous gangue through a thirty-mesh screen it is impossible to avoid grinding the more friable mineral contents to an impalpable powder, which cheerfully floats off on the top of the water towards the tailings pile.

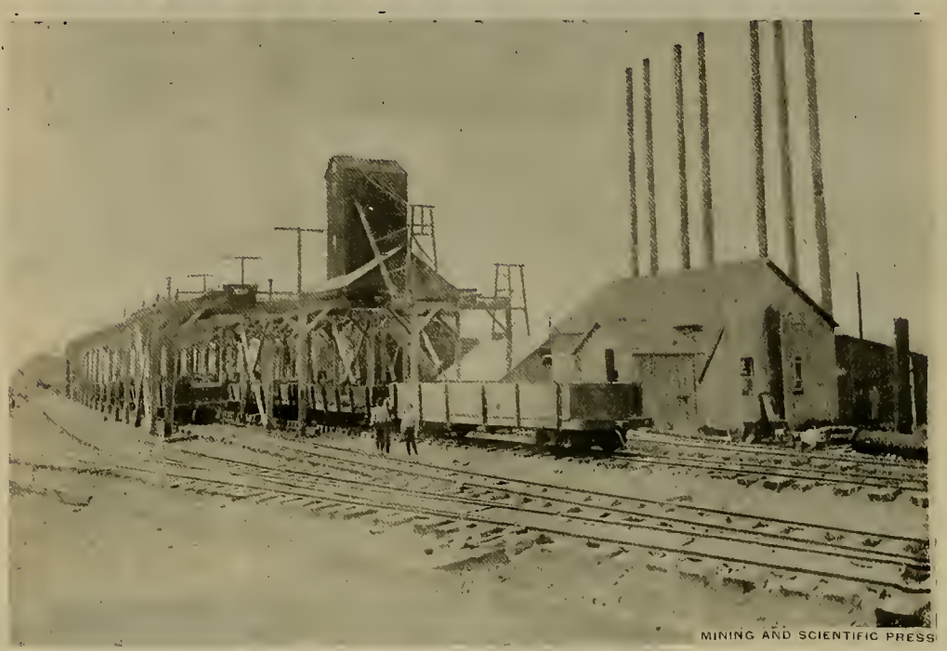
I have been struggling with just such a problem, and after frequent and futile attempts with a modern humping table I have found the solution of the matter in the use of the oil process. I give the details in the hope that some struggling brother may be helped. My ore was the one described above, assaying 18.8 ounces silver and a trace of gold. This, by the oil process, yielded 8.9% of concentrates, assaying 169 ounces silver and 0.10 ounce gold. The cost of crushing and concentration should not exceed $1.00 per ton in a plant of fair size, and with these results a nice profit can be figured out.

The laboratory test is made as follows: Put fifty grams of ore (thirty or forty mesh) into a half litre beaker and pour on about 300 c. c. of water. The beakers to be used should be thoroughly cleaned and, just before using, rinsed with a little strong sulphuric acid, which prevents the oil from unduly sticking to their sides and bottoms. Stir the ore in the water a few minutes to rid it of adhering air bubbles and add 15 to 20 c. c. oil. Now take a beaker in each hand and pour the contents from one to the other, keeping the mixture as well agitated as possible so that the pulp will all flow out at each pour, repeating fifteen or twenty times. If the concentrates are heavy, globules of the loaded oil will begin to sink to the bottom of the beaker. The oil holding the concentrates should now be poured off into a clean beaker, more oil added to the ore mixture and the pouring repeated as before. This mixing and pouring off the oil, with the addition of fresh oil to the ore, should be repeated five or six times, until the oil ceases to take up concentrates from the ore.

If the oil containing the concentrates has been poured off carefully and is comparatively free from water the oil can be removed by heating the beaker until the oil foams, and filling up the beaker with gasoline at once while the oil is hot. This must be done away from fire or light on account of the extreme inflammability of the gasoline. The concentrates will settle out at once, the dissolved oil is decanted off and the residue washed once or twice with gasoline by decantation, the concentrates dried, weighed and assayed. The tailings are allowed to settle, the water decanted off, dried, and if at all oily, washed once with gasoline and again dried, when they are ready for assay. The oil used is a heavy petroleum residue. If this cannot be obtained a mineral lubricating oil of good body can be used for laboratory work.

Improvement In Handling Ore.

In the issue of May 24th the headgear on the Wolftone shaft, Leadville, Colo., was illustrated and described. The Wolftone shaft is operated by the A. M. W. Combination, Leadville, Colo. This single shaft does the work of several shafts—the Mab, Maid, etc. The accompanying illustration shows the improvements made therein in handling ore. The trestle work will allow four strings of cars to stand ready for loading; each string is made up of six cars, so that 400-500 tons of ore can be loaded direct from mine cars into railroad cars. The advantage over bins are: 1. Bins only allow two cars to be loaded at one time without moving. 2. Cost is trifling; this structure costing about $500 a bin to hold the same costs $4000 to $5000.



Handling Ore at the Wolftone Shaft, Leadville, Colo.

The trestle is lighted by electric light. The engraving shows the design of the shafthouse and arrangements for preventing sag and side sway of hoisting rope between sheave and hoist.

Miners' Wages in Mexico.

Why Mexican miners at Cananea, Mexico, are paid $2.75 per day in Mexican silver, while American miners receive from $3.50 to $4.00 in gold in the same camp, is being discussed in Arizona. J. C. Goodwin, from Cananea, tells the Arizona Republican that he asked a Mexican miner why he was getting less than half as much as an American. He thought he knew. He said that in case a native of Mexico was killed while at work about the mine, the company would have to pay for him. If an American or one not a native of the country were killed, he would be already paid for. In the opinion of the Mexican the difference between what the Mexicans receive and what is paid to the Americans is turned by the company into a sort of life insurance fund.

"It is a fact that companies must pay for Mexicans who are killed in their employ, but that is not the reason that American miners are paid twice as much. The Mexican Government will not let the Greene Company pay more and the company cannot get Americans for any less than they pay them. This is the Mexican Government's way of solving industrial problems, or rather its way of preventing them from arising. It is the Government's theory that if the Greene people paid the native miners fancy wages miners would flock there from all parts of the Republic and there would be an industrial plethora there, while mines elsewhere would be deserted. Then there would be strikes, and in Mexico it is not far from a strike to a revolution. Accordingly the Government has fixed a scale of wages for its own subjects, and requires the company to employ 65% of its force in the Republic. The company finds it no hardship to be interfered with and restrained from

paying 65% of its employes more than half as much as it has to pay the other 35%."

[But, after all, the reason that American miners are paid more is because they are worth more. At double local wages they are still cheaper. Cheapness is not regulated by what you pay, but by what you get for what you pay. A man may be cheap at $5 per day, or dear at 25 cents per day. Cheap labor is really the dearest kind of labor where skill is required.—ED.]

Hoisting Works for Deep Mines.

In 1897 this journal began the discussion of Rand requirements in hoisting facilities, it being manifest that the Johannesburg, South Africa, mines would ultimately entail the sinking of shafts 10,000 feet deep, the suggestion being made that the relay system would probably present sufficient practical value to merit consideration.

Considerable has been editorially said herein on that subject, the latest being in the issue of the 31st ult.

The matter is one of economic importance. Hans C. Behr, of California, now in charge of one department of the Consolidated Gold Fields of South Africa, has written a paper entitled, "Winding Plants for Great Depths," which was the subject of discussion at the last meeting of the London Institute of Mining and Metallurgy.

In opening the discussion the president, A. G. Charleton, in the course of his remarks, said: "As time goes on this problem of deep sinking is one which will force itself more and more on the attention of mining engineers, and I think, therefore, that this paper is presented to us at a most opportune moment. The importance of the subject, as far as concerns the Witwatersrand, is evident if you consider for a moment the following facts, to which I would like to draw your attention before you proceed to discuss the paper itself. The average tonnage crushed per month on the whole Witwatersrand for the first eight months of 1899 preceding the war is put, I believe, at 758,514 tons, with a total average number of 5672 stamps, of which number, I understand, 1370 were operated by the first row of deep level companies. Assuming that all the first and second rows of deep levels that started active operations before the war will have reached the producing stage by 1906, that in the meantime some of the first row of mines will have increased their plant; that at the end of the period named some eighteen or twenty new deep level companies will be crushing on an average with 100 stamps, and that outlying areas like Krugersdorp, Bokshurg and Modderfontein will be adding their quota to the quantity of stone raised and crushed, it has been estimated, I am informed, that at the end of 1906 there are likely to be some 10,000 stamps in operation on the Rand. Now, it is obvious that where you are dealing with quantities such as crushing on anything like this basis will entail, a fractional saving per ton must largely affect the gross profits, and so far as concerns the deep level companies nothing will influence the commercial aspect of the company more than economy in winding, since the proportion which hoisting charges will bear to the total cost must obviously increase with greater depth and load. Taking the underground force required to run 200 stamps at approximately 2500 natives and 200 white men, the mere expense of lowering and raising this force daily must amount to a considerable item, without taking into account the much more serious expense of raising the ore. These costs are, however, liable to be considerably modified by the system of haulage adopted and by the design and management of the machinery employed for the purpose, a discussion of which is, therefore, obviously a subject of the greatest importance to mining engineers. Public confidence in deep level mining upon the Rand has, it may be added, been established by the results obtained from the first and second row of deep levels, and attention is now being directed towards deep level areas of 4000 to 6000 feet, in the confident expectation of achieving similar results, as I may remind you that the Turf Club bore has proved the existence of auriferous banket at a depth of 4800 feet. As T. H. Leggett has remarked: 'Although progress in the direction of deep mining upon the Rand has been startingly rapid, it is still the logical result of underground development, of the yield of gold, and the profits obtained from deep level mines now in the producing stage.' It appears from a table compiled by Mr. Leggett that in the Rand district there are 20 shafts that will average 400 to 1000 feet in ultimate depth; 22 that will average 1000 to 1500 feet; 13 that will average 1500 to 2000 feet; 10 that will average 2000 to 2500 feet; 7 that will average 2,500 to 3000 feet; 1 that will average 3000 to 3500 feet; 2 that will average 4000 to 4500 feet; 3 that will average 4500 to 5000 feet; 3 for which no estimate depth is given; making a total of 81 shafts." Grouped in rows, they may be subdivided as follows:

	Average distance from outcrop Feet.	Average ultimate depth. Feet.	No. of shafts.
First row of deep level properties, including Simmer and Jack outcrop	1730	1189	45
Second row of deep level properties	4162	2611	21
Third row of deep level properties	8113	4500	3
Omitted from lack of data	....	....	3
Total			81

E. P. Rathbone thought that the works would interfere with a good system of ventilation. With all those turns from the bottom of the shaft and having to take all those corners it would increase the friction, especially when they were dealing with dynamite and powder smoke, and blasting operations were going on when the first sinking of the shafts took place, and then, where time was of such importance, to get the working places clear of smoke. It also seemed to him that there were so many turns of the rope being taken round with sheaves of a small diameter that the rope would have a much shorter life than with a single sheaf in a straight shaft, as the shaft would be bound round at such a narrow angle; this would also very much increase the danger of accidents due to the breaking of the rope. Another objection to the two-stage system was that the hoisting of men from the two stages would take up far more time than if directly hoisted from the bottom of the shaft. The first cost of sinking such two-stage shafts would also be considerably greater than in a straight shaft. These seemed to him to be some of the objections which mining engineers might make.

F. Irvine said it seemed to him that the proposition discussed in Mr. Behr's paper was limited by two problems. The first, the tensile strength of the rope, and the second, the size and the weight of the drums which it was possible to construct and operate with economy. The propositions before them were (1) of winding in one stage from the ultimate depth of the shaft; (2) of winding in two stages. It would seem improbable that winding from the deepest shafts could be done in one stage effectively, especially when inclines had to be operated from the vertical, and that, therefore, two or more stages of winding had to be fallen back upon. He was speaking, of course, of those very deep shafts which would be the exception to the rule rather than the average of deep mines, the ultimate bottom of which might probably be reached in one stage of winding. It seemed possible also that tapered ropes of the highest grade tensile strength could be manufactured to reach the greatest possible vertical depths unless in the exceptional cases to which he had already referred. It would, therefore, appear that the best practice would be to put down a winder on the surface to work down to the most suitable practical depth and at that point to put down another winder driven by transmitted power from the surface to haul the rock up to the foot of the shaft or stage in which the surface winder operated. That would enable a surface winder to always run balanced, and it would make it a much more economical engine in the consumption of power, and it would enable the drum to be built, if cylindrical, in one piece, that was to say instead of having two drums one drum would be quite sufficient, because the rope would be wound on one-half and unwound from the other. This would, therefore, meet some of the objections of the undue size of the drums which other methods entailed. It was obvious also that in the case of those very deep shafts where a taper rope could not command the bottom of the vertical that this method of winding in two stages could also be applied. Under those circumstances, with the possibility of winding in two stages where necessary, the problem of reaching the bottom of the deepest shafts as far as the rope was concerned might be dismissed as satisfied. With regard to the winders themselves the various systems proposed in this paper has been evolved for different objects. Some winders had been built with cylindrical and some with conical drums. The conical drum seemed to him to have been devised to equalize as much as possible the load on the engine. The Koepe and Whiting systems had been devised in order to get the drums down to as small as possible dimensions, and to therefore save momentum or flywheel action in the machine, and first cost.

The methods proposed for two-stage winding from the surface seemed to him to provide only for a saving of drum size, because although the ropes hung from the surface right down to the bottom of the shaft, they were not all wound upon the drum during the operation of the engine, and, therefore, they might conclude that the only saving to be effected by such two-stage winding with two engines was that the drums of the two engines at the surface were kept small, and there would be no power saved over that used in the small engine, because the loads to be lifted would be the same, both with regard to the weight of the skip load and the weight of rope in each hoisting operation. These remarks applied to the tandem system also, in which the ropes were attached to the bottom of the cages of the first hoist. Neither of those systems, to his mind, seemed to do anything more than make a reduction in the size of drum on the surface because of their not having to wind the whole of the rope used in lifting the ore upon the one pair of drums. Therefore he could not see that this two-stage method of winding would be more economical than the single system, as they would only save the large drums of the single winder, whereas they would entail two sets of drums and extra rope in the one case and some kind of auxiliary winder in the other. If two stages had to be contemplated in a winding proposition of this kind he thought it would be better to put down a winder on the surface running balanced with a constant lift, and with practically constant loads from a given fixed point, and to put at that point an auxiliary winder operated by transmitted power to work the rest of the mine. The conical drum, as compared to the cylindrical drums, was costly and large in size, and although Mr. Behr said that a tapered rope would affect a reduction in their size he could not see that was so, because the taper rope was largest where it was wound first upon the drum. That when the load was at the bottom of the shaft the rope was paid right out, and its largest diameter was on the smallest portion of the drum, and as the diameter of the rope determined the minimum diameter of the drum the diameter of the taper rope at its largest would determine the minimum diameter of the conical drum; and, therefore, the whole of the remainder of the conical drum must be larger in diameter than the size so determined.

Thus the smallest diameter of a conical drum would be of equal size to the diameter of a cylindrical drum to wind on the same rope, and, therefore, the conical drum would be very much more expensive, heavier and bigger in diameter, and require a larger engine to drive it than an engine with a cylindrical drum. This drum has been designed to obviate to a large extent the varying loads upon the engine, to equalize them and to create a greater efficiency and a greater economy. That purpose, perhaps, could be obtained if an engine could be designed to take a large overload at starting without any risk or trouble and to run efficiently down to a small percentage of its full load. That could not be done with a steam engine. A steam engine which was designed to be economical at one point could take an overload, but it could not take a very large overload without becoming too large, and, therefore, inefficient. On the other hand, it could not take a light load without becoming very inefficient. The only motive power which he could think of which would attain these results and thus increase the economy of the operation was an electric motor. It could not only take 50% overload in starting, but could now also be built to run at 20% full load without the efficiency falling off more than 7% to 10%. That was done every day in electric traction, and, to his mind, the problems in electric winding were very much the same. They wanted to start with an overload on the machine, to accelerate quickly, to obtain great efficiency down to the lowest point of load, and to stop equally quickly and without having too much momentum on the machine. Mr. Behr said that the objections to operating underground hoists by transmitted power from the surface were the great first cost of the installation and the additional attendance that was required to operate them. That might be the case if they considered that, in order to operate one electric hoist underground, it would be necessary to install an electric power station on the surface. But as this paper referred very largely to problems which were before the mining engineers of the Rand, he might state that most of the mines there already had their power installations. The electric light was the first reason for their installation. Then power was required to work pumps, cyanide works, workshops and all kinds of machinery distributed about the mine, and it was soon found out that electricity was the best means of transmitting the power, and at the present time all the large mines on the Rand have got their own power stations installed in their engine room. A large mine operated two or three shafts, a large surface plant and other machinery underground, such as pumps, which are nearly all being driven now by electricity, and even small electric winders in winzes and stopes, and so on; these would require a very large power station, and the call for current upon such a station by even a large underground winder would not be such as to make the fluctuations detrimental to the general use of the power. He therefore thought the objection to the installation of this power station would, in the case of the Rand anyway, not be so great as Mr. Behr seemed to think and that, therefore, winding in two stages there with a good surface winder installed on the surface to wind to a fixed point and an underground hoist to do the best of the work, was probably the best solution that could be got.

(TO BE CONTINUED.)

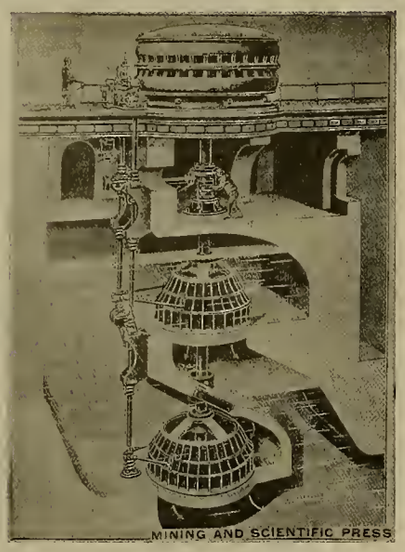
A Two-Story Turbine Plant.

When the city of Geneva established its electrical generating plant at Chevres-on-the-Rhone its engineers had a new and difficult problem, because of the great difference in height of water at various seasons. The head of water at Chevres varies from 8.50 meters at high water to 4.30 meters at low water. It was necessary to provide some arrangement which would give constant speed and power for the driving of the generators.

This problem was solved by building a two-story water station and placing two turbines, one above the other, on each dynamo shaft, as shown in the accompanying engraving. The plant has eighteen sets of turbines. Three of these are used for the exiters. These give but 150 H. P. each. The others which

operate the generators give a mean output of about 1000 H. P. each.

Of the output of the plant about 5000 H. P. is used



Sectional View of Chevres Turbines in Position.

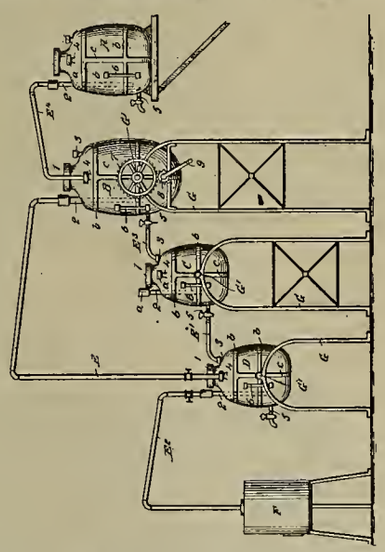
by electro-chemical factories, 4500 H. P. for large motors and for the maintaining of about 55,000 electric lamps, and about 1850 H. P. for the running of small motors.

Mining and Metallurgical Patents.

Patents Issued June 17, 1902.

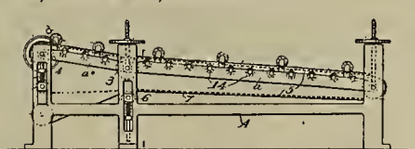
Specially Prepared for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR TREATING COPPER ORES.—No. 702,490; R. Seeman, Ealing, London, England.



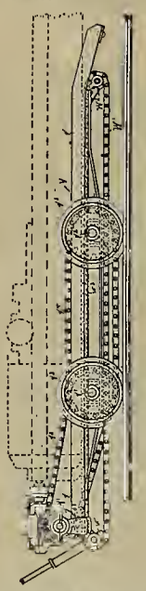
Plant for treatment of ores, comprising safety vessel, mixer revolubly mounted, pipe leading from top of mixer down into safety vessel, settler revolubly mounted at lower level than mixer, pipe leading from top of settler to lower portion of mixer, still revolubly mounted at lower level than settler, pipe leading from top of still to lower portion of settler, pipe leading from top of still down into mixer, several vessels and pipes being of acid resisting material.

ORE CONCENTRATOR.—No. 702,541; L. Cohen and J. Gross, Sombrerete, Mexico.



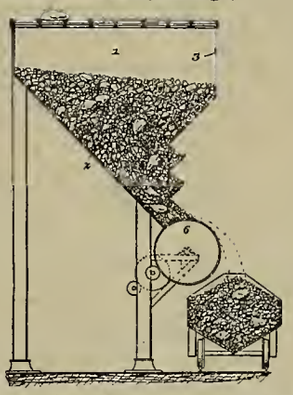
A concentrator consisting in combination of two horizontally disposed bed sections having ends pivotally supported, means by which sections may be moved so as to change relative angles of inclination, rollers upon sections, endless belt supported upon rollers having upper surface conforming to inclination of sections, a second belt supported upon and inclosing first named belt, means by which belts are driven in unison, lateral guides upon outer belt and sheaves having grooves in which guides are adapted to traevl.

MINING MACHINE TRUCK.—No. 702,817; A. Palmros, Columbus, Ohio, assignor to Jeffrey Manufacturing Co., Columbus, Ohio.



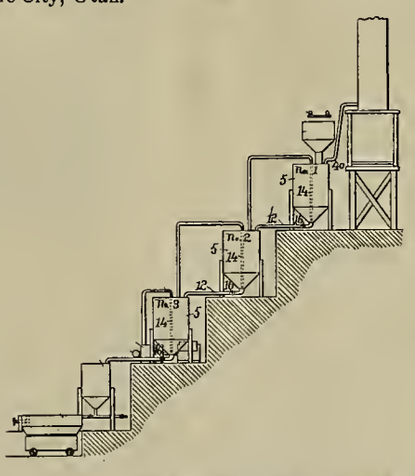
Apparatus comprising wheeled truck and separable mechanism adapted to be transported by truck provided with motor, and rotary power transmitting element actuated by motor and otherwise having fixed position, combination of truck frame, wheels thereon, power transmitting devices connected with wheels, initial power receiving element actuating power transmitting devices having fixed position adapted to mesh or be engaged with power transmitting element on separable mechanism when latter is moved bodily onto truck.

ORE POCKET.—No. 702,731; F. K. Hoover, Kansas City, Mo., and A. J. Mason, Chicago, Ill.



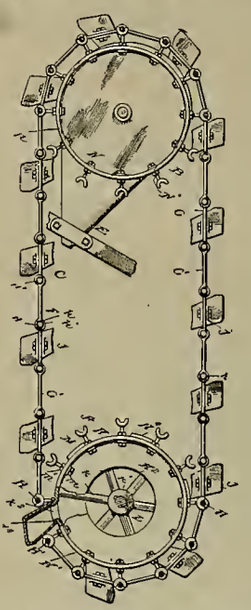
Ore pocket or hopper having converging front and rear walls, in combination with roller journaled below, forming movable bottom wall for discharge outlet, rear wall of hopper extending substantially into contact with periphery of roller, front wall terminating above roller below line marking natural angle of repose of material operated upon and at distance from nearest point of periphery of roller, which is substantially equal to distance between such lower termination of front wall and nearest point on opposite rear wall.

PROCESS OF RECOVERING METALS FROM ORES.—No. 702,582; J. W. Neill and J. H. Burfeind, Salt Lake City, Utah.



Forcing sulphurious acid gas through charge of pulp to agitate same mechanically and to assist in leaching action, then filtering pulp to obtain metal-bearing solution, precipitating metal from such solution thereby releasing gas and returning sulphurous acid gas released by precipitating process for use in agitating and dissolving metals from fresh charges of ore. The improvement consists in agitating the charge of pulp containing ore by gas from roasting furnaces charged with material suitable for producing sulphurous acid gas, separating resultant solution, precipitating metal from solution, employing sulphurous acid gas released by precipitating process to enrich gas derived from furnace and used in leaching charge of ore.

ORE ELEVATOR.—No. 702,892; H. A. Vezin, Denver, Colo., assignor to J. A. Jeffrey, Columbus, Ohio.



Combination with loading drum, having vertically arranged conical parts and filling tubes between conical parts, two series of independently adjustable forked sprockets rigidly connected to filling drum to form substantially two sprocket wheels, sprockets of one series being radially adjustable independently of sprockets of other series, series of buckets adapted to register with filling tubes and chain carrying buckets formed of alternating inner links with bars, G, G, and outer links with bars, G′, G′, pintles, H, H′, hinging the alternating links together, spacing devices between inner bars, G, G, and thimbles, I′ I′, on pintles outside of outer bars adapted to engage with forks in adjacent sprockets.

Bids Wanted on Work.

OFFICERS:
DR. C. R RAY, Pres.
O. C. CRAWFORD, Sec.

OFFICE OF
GOLD HILL QUARTZ MINING COMPANY,
GOLD HILL, OR., JUNE 24, 1902.

MINING AND SCIENTIFIC PRESS,
San Francisco,

GENTLEMEN:

We contemplate the installation soon of a 200 H. P. electric plant power to be furnished by ditch, to operate our mines. We would prefer to contract the ditch and dam, together with the electrical plant, with one firm.

If you can refer us to several reliable contractors for this character of work you will greatly oblige.

Respectfully,
C. R. RAY, Pres.

SEVERAL METALLURGISTS have experimented on the extraction of the copper oxy-chloride ores of Chile by means of sulphuric acid. The average copper contents was 6.2%, and the ore contained 0.873% of chlorine. The gangue is siliceous, however, and contained 3.25% of oxide of iron, which, however, is harder than the copper mineral, so that after crushing it is found that the copper concentrates in the flues. These assay from 10% to 13.5% copper. On treating this material with frequent agitation the whole of the copper was found dissolved in 40 minutes. With the harder and coarser portions of the ore it was also found that all copper practically dissolved, but two or three days time was necessary to complete the treatment. All of the oxide of iron present was found to dissolve and to increase in the solution as the time of contact was prolonged, and also if the strength of the acid was increased beyond 5%. The process, however, was found too expensive for the district in which it was proposed to use it, as the expenses of recrystallizing sulphate of copper several times would be very high.

Mining Summary.

Specially compiled and roported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

The Treadwell Co. daily consumes 140 tons of coal. It comes from Vancouver. A duty of 70 cents a ton is paid at Douglas island.

There is some mining boing done on the Nome beach and miners are rocking out from $8 to $10 a day. There aro good reports from Candlo, Council and other regions. Ophir creek, which is in Council district, is reported rich. The Wild Goose M. Co. owns the claims from 15 to 29 above, and from them may take out this season $1,000,000. Good reports also come from the Kougarok, but Gold Run seems to be not panning out. Nome miners gencrally regard it as a poor showing.

There is a placer stampede from Valdes to the Chittyna. Almost every ablebodiod man in Valdes is off for the diggings.

ARIZONA.

COCHISE COUNTY.

There will be a drilling contest at Bisbee, July 4, 1902, conditions and prizes as follows: Double hand contest, first prize, $800; double hand contest, second prize, $300; single hand contest, first prize, $250; single hand contest, second prize, $100; entrance fee, double hand contest, $25 per hammer; entrance fee, single hand contest, $15 per hammer. Regulation rules will govern contests. Hammers: Eight and four pounds respectlvely. Steel: Seven-eighths. Time: Fifteen minutes.

Near Bisbeo W. Goodrich will develop the Golden Era group of mines. The Brice Glass Co. of Pittsburg is interestsd in the Golden Era M. Co.

At Tombstone the Ground Hog will resume. H. T. Fisher, Supt., says he has made arrangements for new machinery on this property.

At the site of the Douglas reduction works the first building of the smelter plant to be erected will be the machine shop, of brick and structural steel, 216x 79.4 feet, he divided into two parts, one for repairing locomotives. There are now on the ground 14 carloads of machinery.

GILA COUNTY.

W. Sultan, of the Copper Hill Con. M. Co. of Globe, will erect a plant for treating its ores. The properties are between the Old Dominion and the Globe Con. properties. There is a large amount of ore ready for the new plant.

The new leaching plant of the Black Warrior Co. will be closed down and enlarged to three times its present capacity.

The Troy and Manhattan copper companies at Troy are to be consolidated. C. H. Cutting will continue in charge.

W. J Larsen, Supt. Buckeye M. Co., Dos Cabezos mountains, 8 miles southwest of Bowie, has forty men developing mine and building a 50-ton concentrator.

MARICOPA COUNTY.

In tunnel No. 2 of the Catalina Copper M. Co., 275 feet below the surface, the main drift has been extended along the vein 300 feet in ore; average width, 6 feet; ore's average assay, 6% copper. Surveys are ready for the line of the Phœnix & Eastern railroad, Phœnix to Benson. The road, when constructed, will run near the Catalina property.

MOJAVE COUNTY.

The Gold Road Co. is dismantling the mill at Albemarle, N. M., and will move it to the Gold Road mines. A larger hoisting plant is to he put in to carry the shaft to a depth of 1000 feet. The recent sale of a one-third interest in the mine by Posey-McCornick syndicate to French-Swiss people for $50,000 was to carry on exploration. The new company has the Ben Harrison group of mines and placed E. Hilty, one of the former owners, in charge. A gasolene hoist will be placed on that property.

The Supt. of the Ben Harrison group, Kingman, says the shaft on the Bryan claim has ore that affords a $60 average.

PIMA COUNTY.

The Golden Rose M. Co., operating west side Patagonia mountains, near Tucson, has a ledge 75 feet in width, and is rich in native silver.

At the Banner, 30 miles southwest of Tucson, twenty-five men are working. The company is daily treating twenty-five tons of ore, concentrating it.

The Sierritas M. & M. Co. has been organized to develop property in the Sierritas and to erect a smelter. The Banner mines are being exploited. There are many prospectors in the Sierritas at the present time. Development work is being pushed at the Loma Verde mine in the Rincons for the smelter which the board of directors propose to erect. Mining in the Catalinas is at a standstill. If the Phœnix & Eastern Railroad is built work will be resumed at Camp Condon, Copper Hill and the Catalina camp.

W. W. Robinson, representing San Francisco men, who propose to erect a cnstoms smelter in Tucson, has forwarded all the data he has collected and all of the contracts for ore that ho has made, to his clients in San Francisco, that they may examine them and determine whether it would be advisable to erect such a smelter.

PINAL COUNTY.

The Newbury mines, 18 miles east of Florenco, have resumod.

YAVAPAI COUNTY.

E. A. Franke is operating the Theisig group of gold claims, Lower Turkey creek. He expects to have a steam stamp mill in operation on the property by Sept. 1.

The Model G. M. Co. has ore that goes $50 per ton. The main shaft is down 350 feet. The oompany will erect a stamp mill. J. McGinn, assistant manager, has resigned and gone to Prescott.

The 10-stamp mill on the Victor mining property, Lynx creek district, is running. Twenty-five men are working and are down 200 feet.

The grade of the Crowned King branch railroad is 24 miles out from Mayer; 16 miles have been contracted for. Water is running through the 9-mile pipe line from Johnson's Springs to Mayer. It will also supply the Treadwell smelter. J. Mayer has men developing the Cypress mine, on Bigbug, and has a 3-foot ledge of gold and copper ore. The Poland tunnel is now in 920 feet from the Bigbug side of the divide.

Grading from Congress Junction on the Colorado river extension of the Prescott, Phœnix & Santa Fe Railroad is in progress; the road will connect with the Santa Fe near Franconia. Surveyors are at work on the line along the Santa Maria and Bill Williams fork. The road will open a rich mineral section.

Work is discontinued on the Iron King mine, 3 miles from Jerome. Mr. Giroux, Supt. of the United Verde mine, and one of the owners in the Iron King, visited the camp, and after looking over the property ordered the mine to be closed and all the men discharged.

YUMA COUNTY.

The U. S. Geological Survey reports fluorspar in abundance in the vicinity of Dorne. It is used in the manufacture of opalescent glass, but its greatest use is as flux for iron; it is worth about $5 per ton.

At the Monarch G. & C. Co., near Jerome, the 500-foot double-compartment shaft is now down 90 feet. In places the ore body is 3 feet wide. The steam hoist is in operation.

CALIFORNIA.

AMADOR COUNTY.

A 10-stamp mill is to go in on the Defender mine.

Supt. Fisher of the Edinburgh mine, near Wieland, is running a tunnel on the vein, which is about 8 feet wide. Rock from the hanging wall shows free gold.

A new mill for the Kennedy goes in between the east shaft and the old works—twenty stamps at first, capacity increased to sixty later on. A new hoist will he built over the east shaft capahle of extending the works to a depth of 5000 feet.

The Mahoney, at Sutter Creek, is closed down.

The Imperial quartz mine, south side of Sutter Creek, nearly opposite the Baliol mine, has resumed work; a 10-stamp mill is being hauled from Ione.

Supt. J. Ross, Jr., of the Wildman-Mahoney mine at Sutter Creek, is sinking the Wildman shaft below the 1400-foot level and drifting on the 1225-foot level of the Mahoney shaft. Twenty stamps are dropping in the mill.

At the Fremont Con. mine, near Drytown, Supt. Purrington has the Gover shaft unwatered and retimbered 1500 feet. He will have the compressors in operation August 15th. At the Fremont shaft a new gallows frame will be erected this summer and a new engine capable of hoisting a three-ton skip 2500 feet put in. Grading for an 80-stamp mill is begun.

The new shaft at the Sargent mine, Middle Bar, is being timbered with 14x14 inch sawed lumber.

BUTTE COUNTY.

The capital stock of the Boston & Oroville gold dredging proposition may be listed in Boston. R. D. Evans of the U. S. M. Co. is interested in the company.

CALAVERAS COUNTY.

Near Angels B. W. Thayer has a working interest on the Jolly Tar and Davis quartz mines, near Altaville, for $10,000, and in the Ætna, Hecla and Vesuvius quartz mines for $60,000. C. W. Higgins has a bond on the Washington and Last Chance mines for $4000.

Near Jenny Lind the Slate Creek mine is being worked on dividend paying ore. The Big Six claim, McAffee & Williams, near Bear creek, shows a 3-foot vein that goes $16 in gold and $100 in silver to the ton. The Golden Eagle mine is under bond to San Francisco men.

J. V. Coleman recently bought the property opposite the Angels mine of T. G. Peachy for $25,000.

The San Domingo Water Co. has started work on their water and power plant.

The Parnell mine is being worked; new machinery will be put in.

The surveyors for the water company at Murphys will begin work on the canal to run from the middle fork of the Tuolumne to Dogtown, by way of Murphys.

At Mokelumne Hill the shaft at the Giuffra mine is now 100 feet and the first level will tap the ledge. The mill will be in operation as the first level progresses.

DEL NORTE COUNTY.

W. Burgemaster has bought the Yates' black sand mine at Crescent City. Water will be secured from the ocean from power furnished by a gasoline engine.

EL DORADO COUNTY.

The Placerville Republican says the Mount Pleasant mine is employing thirty-five men and the 10-stamp mill crushing good ore. Sinking the main shaft continues.

It is reported in Placerville the Pocahontas mine, near El Dorado, will be bought by San Francisco men.

At the Cambrian mine, near Lotus, a tunnel is being driven to drain the mine and strike the ledge at a depth.

KERN COUNTY.

The American Golden Eagle M. Co., Hellman, about 40 miles from Bakersfield, says it has work for hard rock miners.

The Stanford M. & R. Co., Randsburg, is daily extracting fifteen tons of ore on the Gold Coin property, and is doing development work on the Stanford.

The Supreme Court of the District of Columbia has denied an application for a writ of mandamus against Secretary of the Interior Hitchcock to compel him to approve selections of mineral oil lands in Kern county under forest reserve scrip. This is another victory for the oil men in the case of the Kern River Oil Co. vs. Clerk, which has been fought through the courts and the Interior Department by scripper lawyers. A victory for the scrippers would mean that millions of dollars worth of California oil lands would be taken from their present mine owners.

LOS ANGELES COUNTY.

The annual meeting of the members of the Southwest Miners' Association will he held on July 8th, at 8 P. M. in the rooms of the association, First and Main streets, Los Angeles.

MARIPOSA COUNTY.

Near Coulterville S. E. Rigg has charge of the McAlpin mine. He intends to start the new shaft at the level of the lowest tunnel, 300 feet below the apex, and sink 500 feet. Then 1000 feet of drifting will be done.

NEVADA COUNTY.

Supt. A. D. Gassaway is driving the tunnel at the Union blue gravel mine near North Bloomfield. The company has completed 4000 feet of tunnel, with about 1015 feet more run it is expected that the gravel channel will be reached, where it was abandoned by the Derbec Co.

At the Niagara mine, on Deer creek, the new shaft is down 65 feet; ledge 6 feet in width has been found.

ORANGE COUNTY.

The mines and mill of the Santa Ana Tin M. Co., Trabuco canyon, are 14 miles from El Toro. The shaft is down 50 feet, with a crosscut of 36 feet, crosscutting a 10-foot vein of gold, silver and copper ore; assay value $18 50 per ton. The shaft will be put down to the 100-foot level. The company has expended $55,000, including machinery.

PLACER COUNTY.

The Washington Quartz M. Co. at Bath has bonded the Dewey & Hancock ledge. Supt. Dudley is extending the Dewey tunnel to the ledge 500 feet lower than the upper tunnel.

J. Nihill, in charge of the development at the May Flower mine, is running three 8-hour shifts.

King & Wolford have a shoot of quartz at their mine in Black Canyon, 4 feet in width; a 5-stamp mill is projected. The Black Canyon quartz mine will build a ditch and flume to bring water from Secret canyon to run the mill. The work of excavation for a 20 stamp mill goes on.

The Herald says mines are looking up on the Forest Hill Divide. There is not an idle man in Forest Hill and Michigan Bluff, and men are wanted at the Jarvis mine.

RIVERSIDE COUNTY.

In the Pinacarte district the Santa Rosa M. & M. Co. will do considerable work this season. It has a 20-stamp mill, hoisting plant, pumps, pipe lines, tanks for oil and water, electric machinery, etc.

SAN DIEGO COUNTY.

The latest phase in the Golden Cross mine litigation is that the late receiver, Trumbo, is to personally assume $10,500 of obligations which the court rules should not be charged to the mine. Merchandise claims aggregating $49,000 are to be paid from the mine company funds or from the future operations of the mine. Other creditors claiming $44,000 are to get $20,000 down and half the net earnings of the mine till the other $24,000 is paid. The mine is turning out $45,000 per month, of which $20,000 is profit. Receiver Pauly continues in charge.

SANTA BARBARA COUNTY.

The Interstate Asphalt Co., at More's Landing, near Goleta, has the contract for paving fifteen streets in Brooklyn, N. Y.

SHASTA COUNTY.

The Bullychoop M. Co., 25 miles west of Redding, is removing the 10-stamp mill to south fork Indian creek, and ten stamps will be added to make the crushing capacity sixty tons daily.

W. A. Hall says he will drive a 1000-foot tunnel through the divide between the Camden toll house and Whiskytown, through which it is intended to bring Brandy creek water to Redding and Keswick.

A. Onn, owner Spread Eagle copper claims at Copley, will build a gravity tramway 4 miles from the railroad to the top of the mountain, where the mine is. The ore, he says, shows 11% copper.

The transmission line from the electric power plant of the Hazel M. Co., Crystal creek, will pass through French Gulch on the way to the Gladstone mine. The line will be about 8 miles in length.

The Gladstone, at French Gulch, has seventy men at work. The 20-stamp mill is in operation. Twelve men are employed in the Milkmaid mine and mill.

T. S. Irvin, at the American mine, has fifteen men at work.

SIERRA COUNTY.

R. Phelan at the Gold Ridge mine has twenty men employed.

At the Independence mine, Wolff creek, an 8-stamp mill is in oporation. Ten men are employed. C. M. Root is Supt. The machinery is run by water power, 250 feet pressure, 50 inches of water.

SISKIYOU COUNTY.

The Mother Lode mining claim, Apple Sauce gulch, Russian creek, Liberty mining district, 5 miles from Sawyer's Bar, is bonded to Baker, Henderson & Graves for $25,000.

The 10-stamp mill at the Dewey mine, Gazelle, is running steadily. Thirty-two men are doing development work.

The Punch Creek quartz mine, Humbug creek, keeps the McCook quartz mill running constantly.

H. Marnet now has a 10-stamp mill at his quartz mine, near Hornbrook, using oil for fuel.

The Punch Creek Q. M. Co. will ship tailings over the new Humhug road to the Yreka railroad depot.

W. Quigley, at his river mine, Klamath river, has 300 feet of wingdam built.

The Cherry Hill M. Co. expects to tap the ledge in the 1500-foot tunnel 800 feet below the surface.

STANISLAUS COUNTY.

J. T. Doolittle and A. Brown find encouraging progress in prospecting with drilling machines the gravel in the bed of the Tuolumne river, near La Grange. The rich gravel will he washed by the dredger method.

TRINITY COUNTY.

There is considerable cessation of work in the Sweepstake gravel mine and some sensational stories are published. The conditions, geological and otherwise, were discussed authoritatively at length in this paper in the issue of June 29, 1901.

The San Francisco Construction Co., which has been doing all the contract work at the mine, is locally credited with intention to build a new pipe line for the corporation, and to employ on the job about 200 men. So says Superintendent McCoy of the Construction Co. at Weaverville. A. E. Buckman of the San Francisco Construction Co. says to the Searchlight: "The expectations of peoplo not familiar with the laborious and gigantic undertaking of mine developing are prone to fly high at the beginning, and if things do not materialize in a hurry they are disappointed. It will take a good year of hard work yet, and probably longer than that, before a proper outlet for the removal of the gravel can he made. I am in receipt of a letter now requesting me to hold myself in readiness to place a larger force than ever on the company's property."

The Bartolett placer mine, near the Sweepstake property, is to he opened by the Sweepstake Co.

The Dorleski's new mill is about to start.

The pnwer plant and drills have resumed operations at the Brown Bear mine. Work is being advanced on the Lappin mine, bonded to Eastern people for $110 000. The triple compartment shaft is being sunk frnm the face of the lower tunnel and has attained 150 feet on the ore body. The Midas mine is producing high-grade ore.

W. R. Beall of Redding and J. S. Childs of San Francisco are at New river, where a rich find was made, 1½ mile from the mouth nf Quimby creek. They have a ledge 8 feet wide, assaying $40 in gold to the ton.

Payne & Story are dredging near Trinity Center.

TUOLUMNE COUNTY.

At the Harvard mill. near Jamestown, sixty stamps are in operation. —— On the 300 level of the Crystalline connection is made between the main shaft and the old workings at the south shaft.——The Rawhide and App chlorination plants are in operatinn, daily output being ten tons sulphurets.——The Republican M. Co. will build a dam across Woods creek.

Near Stent the Dutch M. & M. Co. has an ore shoot 14 feet wide, 75 feet long on the 1200 level.

At Tuttletown the Bell mine is unwatered and development work begun. Rich nre, carrying sulphurets and free gold, is struck on the 300 level.

The case of Emerson et al. vs. The Yosemite G. M. Co. has been decided by Judge Nicol in favor of the plaintiffs. It invnlves the Slapjack mine near Groveland.

Near Big Oak Flat the Longfellow mill is under management of L. D. Roberts. The Cosmopolite and Big Casona mine are in nperation, as is the Mohican mine on the Tunlumne river.

A. B. McCaw has men on the Gold Hunter mine at Tuttletown. W. Forsyth has bonded the Toledo mine and the Big Indian mine, near Tuttletown. Options run for two years, purchase price $25,000, $1000 down.

At Jamestown fire in an abandoned stope below the 400-foot level in the Jumper mine is confined there. The mine was temporarily closed.

YUBA COUNTY.

Work on the restraining dam on the Yuba river, below Smartsville, will begin next mnnth.

The Eagle Canyon G. M. Co. is at work on quartz and river claims south of Dnbbins Ranch.

COLORADO.

BOULDER COUNTY.

At Eldora the $250,000 chlorination plant, completed last year, is in the hands of a receiver, because of the murder of its owner. The Revenge mine, which can produce enough three-ounce ore to run the mill, talks nf a tunnel to enter Bryan mountain at the foot and cut the Revenge at a depth of nearly 1000 feet. The Boulder County mill at Cardinal and the St. Louis mill at Caribou are in operation.

At Cardinal the Boulder County mine has its stamps dropping on nre. The mine has ore enough in sight for two years. The St. Louis, at Caribou, has started up. In the Phœnix district the Champion is producing ore; Eastern men are about to start up the German and Phœnix No. 2, which have bodies of low grade ore, also a sized streak of smelting ore Considerable placer mining is being carried on along Beaver creek, 2 miles south of Nederland.

Boulder reports the Logan mine again showing high-grade ore. In the lower tunnel, 900 feet beneath the surface, ore is being shipped from a 6-inch streak, worth ten ounces gold to the ton.

CLEAR CREEK COUNTY.

Near Idaho Springs a 3-inch seam, carrying values of $35 per ton in silver and lead values, is reported in the property of the Omar G. M. Co.

The Freeland Extension M. & M. Co. of Mitchell, S. D., will operate the Freeland Extension mine at Idahn Springs.

The Golden Lilly 20 stamp mill at Alice is in constant operation.

The Idaho Springs Gazette says the breast of the Miami nr Wilcox tunnel is in 3000 feet. The west drift on the Edgar vein is in 1100 feet.

The Courier says the Empire tunnel is now over 1000 feet in length, and advancing at an average rate nf 5 feet per shift. Fnur lodes have been cut; the breast of the bore is now directly under the Paymaster lnde that is opened in the upper level. The tunnel has a steel ventilating line, 3 inch power line, and nne track laid with 20 pounds of steel rails. When completed this tunnel will penetrate Cnvode mountain 10,000 feet, through the company's territnry the entire distance, and will enter the district at North Empire 750 feet lnwer than any workings there at present.

CHAFFEE COUNTY.

Manager Goodwin of the Ohio & Colorado Smelter at Salida says four of the six furnaces are in position. The plant will be blown in Aug. 15.

EL PASO COUNTY.

The Colorado Springs Mining Exchange will reduce the membership to 100.

FREMONT COUNTY.

The New Jersey Zinc Co., at Canyon City, is using the Wetherell magnetic separation process, and asserts ability to handle with profit a lead-iron-zinc ore carrying 20% zinc. The ore should carry snme lead in order to make up the values. The grade of ore is too low where lead is absent to make a 20% or 25% zinc-iron material pay.

W. S. Stratton is reported negotiating for the purchase of the Metallic mill at Florence. If be fails to make a price he will erect a mill of his own to treat the lower grades of his Cripple Creek properties.

Crystallized lead ore has been found by Florence men near Isle, 4 feet from the surface. The vein is 2 feet wide; parts of it assay 50% lead. The Grant smelter people will buy the two adjoining claims on the same vein.

GILPIN COUNTY.

D. Woods, in the Powers mine, Russell district, has shipped sixteen tons enargite ores to the Argo smelters; the last shipment gave values of $47 per ton.

The British mine in Illinois-Central district is being operated under a lease and bond by the Golden State M. & M. Co. The ores are divided into concentrating and smelting classes, the latter giving average values of between $35 and $45 per ton. The ores show lead and gray copper.

The Chase mine, Russell district, is figuring on unwatering to its total depth, 500 feet, and sinking. Leasers are working in the 300-foot level taking out ore.

The Four-Mile Gulch M. Co., in the Wheeler shaft, Enterprise district, will retimber and sink 275 feet. J. Brohl is in charge.

Milling ores are being shipped from the Galena mine, in Central City district, to the Black Hawk mills.

A new shaft building has been erected over the main shaft of the Horseshoe mine, in Enterprise district, by the N. N. T. M. Co., and a gasoline hnisting plant installed. The shaft, now down 125 feet, will be sunk to a depth of 500 feet to connect with the Wabash tunnel of the group of claims.

Ore shipments from the Black Hawk depot to smelters and other points of treatment for the first half of the month were 241 cars—4820 tons.

Operations are resumed on the Central City mine. The ore carries pyrites of iron, gold and silver values.

GUNNISON COUNTY.

At Crested Butte considerable development work is being done. Machinery will be installed on the Painter Boy. The Washington gulch placer mines have resumed operations after having been idle for nearly twenty years. G. McCay is in charge of the work. A reservoir has been built and 3500 feet of high-line ditch constructed to carry water to the workings. The water has a perpendicular fall of 170 feet, yielding a pressure of nearly 125 pounds to the square inch.

In the Irwin district the Ruby M. Co., operating the Venago and Forest Queen, is working. Supt. J. K. Hallowell states that the price of silver influences the operatinn of these mines.

The International M. Co.'s Ruby King has resumed operations.

Supt. Jno. Lynch of the Grizzly Mountain M. & M. Co., located northwest of Grizzly Peaks, will put in a mill.

Supt. A. W. Hall is working the Hall placer.

The Akron Mining Co., under the direction of Supt. Harper, has been running a tunnel since August, 1901. Over 1800 feet has been made. They are working three shifts every twenty-four hours, seven days every week, and expect to finish the 3000 feet in 1903.

LAKE COUNTY.

Leadville merchants complain that freight rates are cheaper from Chicago to Salt Lake than from Chicago to Leadville.

Work is to be resumed on the Homer placer, west of Leadville, 150 acres, through which it is believed the Leadville basin nre chutes extend.

The News-Dispatch shows that Leadville needs an independent smelter to open a market for the product of the small mines. The large mining companies have made contracts with the smelting trust, and the small operator must either accept the contract at a price that will leave him no profit or abandnn mining altogether until an independent smelter comes in. On the other hand, the independent smelter must look to the small mines for the greater part of its supply. The big mines have made contracts with the smelter trust, and the independent smelter can only expect to receive contracts from the mines that are nnt tied up. If Leadville had two or three independent smelters there might be a new market for 500 or 1000 tnns of ore more than is now being consumed.

At Leadville, in the Fryer hill section, the Fryer Hill Mining Co. is draining the hill preparatory to opening 150 acres of territory. The Colorado & Southern and Rio Grande have grading crews at work on spurs to several of the shafts of the Fryer Hill Mines Co. The Rin Grande will put in a coal switch to the El Pasn and the other line will run spurs to the Tip Top, Jamie Lee and Dunkin.

MINERAL COUNTY.

At Creede the output of ore for the present mnnth to the 14th inst. was 185 cars, carrying 2942 tons. The Humphreys mill has resumed work.

OURAY COUNTY.

The Ouray Herald says: "After making a sale of his Camp Bird mine, Mr. Walsh, cnntrary to the precedent set by most wealthy men, did not fail to remember the men of brawn and brain who made it possible for him to acquire his millions. All of the old employes were handsomely remembered by genernus checks, while his head men received checks ranging in amount from $500 to $5000, according to the time spent in his employ and the service rendered. The checks handed to his faithful Supt., J. W. Benson, A. Richardson and D. R. Reed, of course, ranged in amounts much larger than this, some placing it from $15,000 to $25,000 for the two latter, while the fnrmer, perhaps, did not receive less than $50,000."

SAGUACHE COUNTY.

In Bonanza district new concentrating mills are being built. The smelter being built at Salida is expected to aid in development work. A 100-ton concentrating mill has been completed by Mr. Weens.

The Little Sister G. M. Co., under the management of J. MacMillan, has secured a group nf claims nn Kerber creek, which they propose tn work through a tunnel, and will erect a concentrating plant of their own

SAN MIGUEL COUNTY.

Five miles west nf Telluride, for the first time in sixteen years, bedrock has been found at the Keystone placer.

The entire Gold King mine has been leased aud the mill is crushing ore for the leasers The tramway, partially wrecked by the snowslide on Feb. 28, is repaired. Twelve parties have leases on different parts of the mine. The company may erect a cyanide plant to treat the tailings that have been accumulating in the basin below the mill for the past fifteen years. There is enough to keep a 100-ton plant running for several years.

Near Telluride, the crosscut tunnel at Liberty Bell mine is in 400 feet. It is the lowest tunnel ever projected in San Miguel county. It commences at the curve station of the tramway, one mile below the mine by trail, and when completed will be 3000 feet long, and intersect the Liberty Bell vein 900 feet below the main working level of the mine. Electric machine drills are used, from 3 to 6 feet are broken daily.

SUMMIT COUNTY.

At Robinson the new pyritic smelter is at work on the ores belonging to the company, which come from their Washington and Robinson mines. At present the smelter does not intend to do custom work.

Near Kokomo the Michigan mine, under the management of G. T. McDnnald, is shipping seventy-five tons per day.—— The Wilfley mine, operated by the Colorado Zinc Co., is daily shipping forty tons.

Near Breckenridge the Gold Pan Co., finding that the bank next to the river at their placer pit was giving way, flumed the river and turned the stream entirely away from the works in sixteen hours' time, grading and building woodwork of a flume 600 feet long and 6 feet wide.

The American Dredging Co., on the Swan, is doing well with dredger and hydraulics at the mouth of Galena gulch. Among the nuggets washed out was one worth $128 by weight. Manager Dyar is figuring on two more heavy dredgers.

TELLER COUNTY.

Manager Johnson has suspended work on the Longfellow, Murphy, Lucky Gus and Six Point properties of W. S. Stratton. He thinks work may be resumed in a few weeks. About 200 men are laid off.

President Roosevelt has referred to the Attorney-General papers in relation tn the Hull City placer mine, Cripple Creek district, with a request that he make an early report. The papers were filed with the President by J. A. Owenby of Colorado, who charges that fraud was practiced in obtaining title to the property. Several Government officials are implicated.

New machinery, on the way for the El Paso mine, on Beacon hill, will be in operation Sept. 1. The 2000-foot hoist will be in operation July 10. The company expects to run the mine under a full head of steam Sept. 10. A sampling department is being installed in the new ore house.

The Cripple Creek railway rate war ends July 1.

The Portland G. M. Co. will re-incorporate a new company under the laws of some other than the State of Iowa, transferring all the property nf the cnmpany to the new corporation. The object is to escape double taxatinn, practiced because it is incorpnrated under the laws of Iowa while its property is located in Colorado. The Iowa tax amounts to $52,500, and the Colorado tax about half that sum.

At Cripple creek, the Wishbone G. M. Co., owning the Faithful claim on Mineral hill, have given a ninety-day option to New York men for $25,000. The formation is phonnlyte quartz and is a contact vein.

After 300 feet barren ground the Blue Bird, on Bull hill, has in a crosscut driven from the 1100-foot station a body of ore that is rich. The Moose has ore in its 1100-foot drift, after having done a great amnunt of development wnrk. The fact that both of these properties have found splendid ore at depth has convinced people that it is a deep mining section.

IDAHO.

BOISE COUNTY.

(Special Correspondence).—The dredgers at Centerville are to be put in operation again this season, after being idle fnr nearly three years. One dredger is already at work and is doing well. The companies have been reorganized and are being run on a business basis. The ground is easily dug, the gold is not hard to save, the bedrock is a decomposed granite, and there are good values in the ground.

Prospectors are heading for Thunder Mountain. Supplies were selling in that camp at starvatinn prices until recently. A wagon rnad from here thence will permit heavy freighting by September. A 100-stamp mill is projected for the Dewey mine.

This spring has been a record one for shortness of the water for placer mining. Very little snow fell until the latter part of the winter, and consequently there has been little placer mining done in the Boise basin this season.

At Quartzburg a steam shovel and separate washing machine is up for Blaine & Nye. This shovel works nn bedrock and will handle a large amount of gravel with a minimum amount of water.

Centerville, June 13.

ELMORE COUNTY.

Manager D. Reber will resume work on the property of the P. M. Co., Dixie district, 25 miles north of Mountain Home.

KOOTENAI COUNTY.

Tyson, the new gold camp of southern Kootenai county, is 60 miles south of Cœur d'Alene, on the St. Maries river. The camp is reached by boat from Cœur d'Alene to St. Maries and then by stage 22 miles. The placer claims discovered by Tyson and Renfro are the Gold Nugget and Sixteen to One. With crude methods the discoverers took out $473 in ten days' work. The claims were then bonded to R. Neill, of Spokane, for $6000. The yield in gold has been from 10 to 60 cents a pan. Mr. Neill is now having a 4-mile ditch dug to increase the water supply. Considerable development work has been done on a number of quartz claims. The most important discovery has been in the tunnel now being run on the property of the Richmond G. M. & M. Co. On driving the tunnel 160 feet a quartz ledge was cut, from which specimens shnwing free gold were taken. Samples of this gold bearing ore indicate that it is a quartz porphyry. It is, from all appearances, a sedimentary formation, composed of thin layers nf various discolorations, and resembles a light brown sandstone. It is friable and when first taken frnm the tunnel can be cut like chalk. When exposed to the elements it slacks like lime. Tyson lies between the Cœur d'Alene and the Hoodoo districts. It is densely covered with timber and underbrush and has never been thoroughly prospected. The territory has been thoroughly explored by timber cruisers and rich specimens of float have been found in various parts. It is what prospectors call a "blind country," and fnr that reason it has been "passed up."

LEMHI COUNTY.

The new tunnel on the Tri-Metallic is to be driven 200 feet, 4½x7 in the clear. S. E. Bowler, general manager. The vein is visible on the surface as it cuts through the slate and serpentine formation. The claims are in El Dorado canyon, a mile above the El Dorado's 20-stamp mill.

OWYHEE COUNTY.

Near Silver City, the machinery for the Addie mine is in. The mill will be in

operation Aug. 1. The Wagener mill is crushing ore from the Never Sweat, which runs $100 in gold to the ton.

SHOSHONE COUNTY.

At Delta, the dredger company is ground sluicing for a place to set the dredger to work.

Wallace reports that the Nine Mile M. Co. has a 1600-foot tunnel cut into ore. Manager Flink does not expect to open up a large shoot until the tunnel is extended 125 feet farther.

The largest bridge built entirely of timber in the world is to be erected at Stephens peak for the Park M. Co. It had been decided to put in a new road to carry ore to either Wallace or Mullan, and it is necessary to build a big bridge, the longest bridge of timber in the world, one span of it to be 450 feet. It is to be of the cantilever style of construction, total length 900 feet. The bridge will be so high that no false work can be built. The bridge must be its own scaffolding in the course of construction. All the lumber will be sawed and fitted at the spot. The timber of the country is white cedar and Douglas fir. Cedar will be used for the piles and fir for the framework of the bridge.

WASHINGTON COUNTY.

Roosevelt, Thunder Mountain, reports little development work done yet. The Dewey mine is good property with a small amount of development; Fairview is the only other property which has more than a 10-foot hole to its credit. The reports that the camp is a failure are not based upon prospect work, for there is not a barren hole in the camp. The food supply is limited to immediate demands for necessaries. The roads are passable for horses, but the snow, mud and high waters interfere with traffic. The usual addition to outside prices is 20 cents per pound. Demand for liquid refreshments is fully met.

At Landore, E. C. Winchester, in the interest of Colorado properties, has bonded for $45,000 the Daisy group, adjoining the Salzer properties, and Mr. Winchester will do development work.

MONTANA.

FERGUS COUNTY.

W. D. Wrighter of Spokane has bought the Surprise group of mines for $30,000. The property is on the eastern slope of the Judith range, midway between Maiden and Gilt Edge.

In the sapphire mines of Yogo during the last year 100,000 carats of cuttable sapphires and 5000 ounces of stones sold for mechanical purposes, having an aggregate value of upwards of $60,000, were taken out. This year's output will be doubled. C. T. Durell, formerly of Gilt Edge, has been engaged as engineer. New machinery will be installed. Thirty men have been working at the mines, to be increased to fifty.

FLATHEAD COUNTY.

Snow is still deep in the West Fisher mining district. The Brannagan mill has been in operation all winter. The owners of the Black Tail mine have their mill finished.

GALLATIN COUNTY.

F. L. Klein says the vein of corundum, owned by the Montana Corumdum Co., on Elk creek, is 42 inches in the clear. Stoping will begin when the mill is ready.

GRANITE COUNTY.

The Montana G. M. Co. is operating near Princeton.

The Dorothy G. M. Co., South Boulder, projects a mill for treating the output.

D. Jankower is general manager American Gem M. Co., which operates on Rock creek upon sapphire properties.

The Howard Copper Co.'s properties are 10 miles north of Phillipsburg. The company will spend considerable money in opening up the property.

JEFFERSON COUNTY.

At Basin, W. Thompson is superintending the Buckeye mine. The vein is a contact between porphyry and granite. The concentrates net the operators from $25 per ton in gold and silver.

Gold ore is reported in the Grey Eagle mine, near Comet.

MADISON COUNTY.

Near Summit, E. D. Lewis has 3 feet of gold ore in the Montana Twister. Teal and Riddel are operating a 5-stamp mill on ore from the Shafter mine. The mill crushes twenty-five tons of ore per day. The rock averages $35 per ton.

F. R. Merk, owner Broadway mine at Silver Star, is working a small force; as soon as legal troubles are settled the number will be increased.

MISSOULA COUNTY.

The bond held by New York men on the Barnes-King mines and mill on north Moccasin mountain has expired. The Barnes-King people will operate it themselves. E. W. King says he will increase the capacity of the Barnes-King mill. When improvements are completed the mill will have a daily capacity of 225 tons.

PARK COUNTY.

Two mills will be crushing ore in the Bear Gulch district by August 1st. One belongs to the Revenue Co., and has forty stamps, the other the Bear Gulch Co.'s, will have forty stamps when completed. The two are 400 feet apart.

The St. Julien M. Co., at Emigrant, will resume work at the mill.

POWELL COUNTY.

At the new gold mining camp of Danielsville, at the head of Race Track creek, the Amazon group is the principal one. There are two veins, one showing 8 feet of ore, average value $16 in gold. The town lies upon a bench of the creek, with mountains of feldspathic granite 4000 feet high. There are fifty-two tents in the camp and two log buildings. A twenty-room hotel is being built. The Amazon Co. has thirty-five men employed and will put in a stamp mill and an aerial tramway. A road is being built from Race Track station to Danielsville, at a cost of $5000, and two miles of road will be built from the mine to the millsite. The Yellow Jacket mine has a 200-foot tunnel, with 1800 tons of ore on the dump that will average $16 to the ton.

SILVER BOW COUNTY.

Butte hears that W. A. Clark will shortly begin work on the erection of a new 2000-ton smelter near that city.

NEVADA.

EUREKA COUNTY.

Supt. C. Read of the Diamond & Excelsior M. Co. of Prospect mountain will start machine drills in the lower levels of the Excelsior mine.

LINCOLN COUNTY.

It is locally asserted that negotiations are practically closed for the purchase of the De Lamar mine by the Venture Corporation of London. The price will reach $5,000,000 cash. It is stated that eighteen months ago the property was offered for $2,500,000, recent development work warranting the latter higher valuation. The purchasing corporation will reorganize the holding into a British company and promote the shares on the London stock market. The Guggenheim Bros. are understood to be negotiating for a large block of the stock for sale in this country. S. Guggenheim is reported to be personally interested in the acquisition of several thousand shares of the stock of the reorganized company.

The Raymond-Ely West M. Co. has incorporated in Salt Lake, Utah. The company owns the Linevada, Linevada Nos. 2 and 3, Mother Lode and Mother Lode Nos. 2 and 3 claims, Ely mining district.

LYON COUNTY.

The sheriff of New York county, N. Y., has sold out the office furniture of the Carson River Placer M. & Dredging Co. at 18 Broadway for $82 on an execution for $27,346 in favor of P. Halstead.

NYE COUNTY.

(Special Correspondence). — Manager Leonard has gone to San Francisco to bring up a 20-stamp mill. He has promise of 20,000 tons to run through at $15 per ton.

Tonopah, June 21.

Tonopah men have agreed not to handle fireworks in any way on the coming 4th of July. That is a good idea. Patriotism is all well enough but one insignificant little firecracker or rocket can start a $100,000 fire in a dry mining camp.

The new town of Weepah contains thirty tents, an assay office, two saloons, two stores, a feed yard and a restaurant. Water is supplied from two springs at the south end of Lone mountain and from two wells 6 miles west of the camp. Wood is accessible. Free-milling ore can be hauled to Silver Peak stamp mills and a profit returned on $20 ore. Supt. F. M. Ish of the Fissure claim says ore hauled to Silver Peak, 9 miles, can be milled for $10 per ton.

The properties controlled by the Nevada Co. at Austin are to be opened up to leasers. The mines contain drifts aggregating 30 miles in length.

WASHOE COUNTY.

The Colorado-Nevada G. M. Co. at Wedekind have the main shaft at a depth of 150 feet in what appears to be the top of the ore shoot in the main Bell vein.

WHITE PINE COUNTY.

The shaft on the McKinley mine at Ely is down 300 feet; crosscutting commenced. In addition to the copper values, low-grade ore averaging $5 is found.

NEW MEXICO.

GRANT COUNTY.

J. G. Barton, superintendent of the Pacific Union Smelting Co., Lordsburg, will put in a furnace of 100 tons capacity, 42x 96 inches, to handle sulphide ore, making a high grade matte, or changed to handle oxides and carbonates and make black copper.

The Colorado Fuel & Iron Co. in the Fierro mining district has opened the Union Hill and Jim Fair properties, and has 125 men on the Union Hill mine and 250 on all the properties. Thirty cars of ore are being daily shipped to the company's plant at Pueblo.

The St. Louis mine, Fierro district, is being pumped out. A new level will be started 200 feet from the surface.

SANTA FE COUNTY.

The Bottom Dollar mine, near Cerrillos, is being worked steadily.

Supt. D W. Briel, of the North American M. Co., near Lordsburg, is developing the Cobra Negre.

OREGON.

BAKER COUNTY.

At Sumpter a contract has been let for 500,000 brick for the proposed smelter there.

Sumpter reports that W. B. Sargent has sold the Yellow Daisy group, Spokane hill, opposite the Red Boy, for $20,000.

GRANT COUNTY.

A chain, each link of which weighs 500 pounds, is a feature in the construction of the Pomeroy dredger, North Fork John Day river. There are 729 of these links. The chain is to carry twenty-seven buckets weighing 1000 pounds each; they carry 8 cubic yards of earth each, 96 cubic yards lifted each minute. The company has put over $100,000 in the dredger, of which $30,000 was wages. It will cost $100 a day to run the machine when finished, one item being twelve cords of wood required each day to run the plant. There are fifteen mechanics working on the dredger construction. August 1 the dredger will be ready to start.

SOUTH DAKOTA.

LAWRENCE COUNTY.

Near Deadwood the Uncle Sam mine, owned by the Clover Leaf Co., have reached the 500-foot level in the vertical shaft.

The Globe M. Co. of Lead will erect a stamp mill at Nahant, 10 miles south of Lead, on Rapid creek.

G. M. Nix of the Oro Hondo M. Co. has the necessary amount of money to develop 700 acres of ground south and adjoining the Homestake and Belt Development companies' properties.

UTAH.

BEAVER COUNTY.

At Milford, Manager E. T. Wolverton of the Cave mine says in two months he will send out 50 tons per day. The lease and bond on the Cave property calls for $135,000, and runs for eighteen months. The first payment of $5000 has been made. Mr. Wolverton is also operating the Blue Boy group, in the same vicinity, and has 35 men.

IRON COUNTY.

The mill at the Johnny Co.'s Stateline properties will be built by Dederichs & Burke, who guarantee its completion Nov. 1.

JUAB COUNTY.

The Tintic Miner says the Grand Central M. Co. has contracted to deliver to the smelter of the Bingham Con. G. & C. Co. 175 tons daily of its low-grade ores, of which there are 70,000 tons already on the surface. The new East Tintic railway, which runs to the Mammoth mine, will be extended to the mine of the Central, and within six weeks the company expects to begin shipping. The ore runs $12 to $14 per ton.

J. C. McChrystal, Supt. Godiva Co.'s property at Eureka, says that the Eagle & Blue Bell's second-class ore is shut out of the market on account of the railroads enforcing the $15 valuation on ores under the reduced rate. Two trial lots of Eagle & Blue Bell sampled $15.06 and $15.34—a few cents too high.

P. T. Farnsworth, manager Bullion-Beck mine, says that property will ship no more ore for the present, because the smelter people have raised the treatment charges 50 cents per ton. They also insist upon long-time contracts, running from three to ten years, with one-third of the value of the silver whenever it exceeds 60 cents an ounce. He seems to think that the smelter trust would insist upon extortionate treatment charges and long-time contracts, and that the only remedy was in withdrawing ores from market.

At the Uncle Sam mine it is the intention either to erect a concentrator or ship to the smelter.

The American Smelting Co., in its contracts for ore, now has a clause giving one-third of the silver values when the price reaches 60 cents per ounce or more.

SALT LAKE COUNTY.

The new Murray smelter has begun operations.

TOOELE COUNTY.

Mercur was swept by fire on the 25th. Forty stores were destroyed. So far as known no loss of life resulted. Total loss, $800,000; insurance, $350,000.

The crosscut in the new channel of gold-bearing ore at the Con. Mercur shows the entire mass has an average of $7 gold per ton.

The Honerine Extension M. Co., at Stockton, will develop its properties, the Vulcan group, that adjoin the Honerine on the east. The shaft on the Vulcan is 270 feet deep.

WASHINGTON COUNTY.

The Silver Reef M. & R. Co. has a contract to handle all the tailings at the three chief mines in the old camp of Silver Reef. T. Ferguson is manager. He will put in cyanide plants. The Silver Reef Co. has acquired the Christy, Barbee & Walker and Leeds Co.s' dumps of 300,000 tons, carrying six ounces of silver per ton.

WASHINGTON.

FERRY COUNTY.

H. B Ives, president Apollo G. M. Co., operating the California, 9 miles from Republic, has built a bin, capacity of 300 tons, on the line of the Great Northern and is shipping ore.

SNOHOMISH COUNTY.

Near Index R. H. Stretch has charge of the Nonpareil Co.'s thirty-six claims on Trout Creek.

SPOKANE COUNTY.

All mineral operations upon the Indian reservation are postponed until after the allotments have been completed, and the President has given public notice thereof through its proclamation. All attempted mining locations which have been made in this reservation on the face of this pending legislation are without any effect.

STEVENS COUNTY.

The mineral entries made by the First Thought Gold Mines, Ltd., of Bossburg, for the First Thought mine and other lodes have been approved for patenting by the Commissioner of the General Land Office. Owing to litigation, operations have not been conducted, and though the company won a recent suit, it did not want to start the mine until after the Land Office granted a patent. One patent applied for previously by the company has been decided adversely, but the company immediately made a strong application, which has been decided favorably.

WYOMING.

CARBON COUNTY.

Saratoga reports that the Mohawk gold mine, at Gold Hill, has been sold to Indiana and Illinois men for $20,000. Picked specimens from the vein have given assays of $56.

FOREIGN.

AUSTRALIA.

The gold exported from Western Australia during May amounted to 61,467 ounces; 102,750 ounces were received at the Perth Mint. The total for the month, after the refinement of the portion received at the Mint, was 141,116 ounces, valued at £599,426, compared with 144,087 ounces of crude gold in May, 1901.

The deepest shafts in South Australia are at Moonta, 2520 feet, and 1710 feet at Wallaroo, the principal seat of copper mining.

BRITISH COLUMBIA.

Vancouver reports that the Canadian Pacific Railroad has refused an offer from the U. S. Steel Co. of $1,000,000 for its iron deposits at Kitchener, Crow's Nest Pass. Details of an agreement are being arranged, however, looking to an allotment of territory in which the steel trust will have monopolistic privileges.

Near Nelson the Oyster and Imperial groups, Fish Creek, have been bonded to the Ophir Lode organization for $86,000. The purchase price includes a cash payment of $35,000, the balance in sixty days. The new company will build a mill and tramway.

The Rossland Mining Recorder's office contributed to the provincial treasury from 1895 to 1901 $408,623; $8,400,000 has been distributed in Rossland camp in the form of wages since mining first began there, seven years ago.

At Slough creek, near Ashcroft, Manager Jno. Hopp has tapped an ancient channel whose bedrock gravel lies 365 feet below the surface.

London stockholders have sent another committee to Rossland to examine the Le Roi mine conditions. They will reach there July 1. It includes A. J. McMillan, manager Snow Shoe mines, A. Morten, H. Tyler, C. W. Milne and B. Brown.

The Le Roi expects to get a rate of $6.50 a ton on coke for its smelter at Northport, on the completion of the Great Northern railway into the Crow's Nest Pass coal fields. The present rate is $9.50. The

Great Northern Co. has refused to reduce the rate of 40 cents a ton on hauling ore from the mine to the smelter.

The White Bear mine has been enjoined from interfering with the surface rights held by E. C. Finch, owner of the White Bear addition to the townsite of Rossland, before the Supreme Court in Victoria.

H. L. Frank of Butte, Mont., has sold a three-quarter interest in his coal mines at Frank, Alberta, to a French syndicate for $1,300,000. About $75,000 is said to have been paid down.

J. Beaver is working his claim, the Diamond B, near Similkameen. This is the property from which Baker & Co. of Newark, N. J., got platinum assays.

At Grand Forks Porter Bros. have a contract to quarry 100 000 tons of ore from the surface of the Granby gold-copper mines at Phœnix. Their plant comprises steam shovels, engines and derricks. If the contract is discharged to the mutual satisfaction of the contracting parties the Granby Co. has agreed to give Porter Bros. a supplementary contract for the extraction of 5,000,000 tons of ore from the surface quarries of the Knob Hill mine.

The National Hydraulic Mining Co. at Beaver river on the Quesnel, Cariboo, have finished 5.33 miles of ditch and flume and 2000 feet of pipe line. Pipe is 22 inches, reduced to 9; ditch capacity 2000 miner's inches. The company is busy sluicing.

Near Phœnix work is resumed on the Emma mine, Summit camp. A contract has been made with the Hall mines smelter of Nelson for two cars daily. The ore contains a large percentage of iron. W. T. Smith is in charge of the work.

KOREA.

H. F. Meserve, general manager L. S. J. Hunt mines in Korea, is in Seattle. The mines are 300 miles from Seoul, the capital of Korea. The concession from the government covers 25 square miles. The rock is gold-bearing quartz, some of it low grade and some of it very high grade. "Just at present we are operating 120 stamps on the properties, and two cyanide plants," says Mr. Meserve. "We are now building an 80-stamp mill, which is very near completion. This will give us 200 stamps in all. In addition we have our own retort works and assay offices. The product of the mines is shipped to Japan in the form of gold bars. We are now employing 7000 miners, including between 75 and 100 Americans. The others are Koreans, Japanese and Chinese. The Asiatics receive 25 cents in gold or 50 cents silver money per day, on which they live very well. They are excellent workmen."

MEXICO.

SONORA.

The Supreme Court of Mexico is reported to have made a decision which gives the Picacho gold mine to the Douglases of the Copper Queen Co. The mine is 10 miles west of Bacoachi.

E. H. Roberts, manager of the Henrietta M. Co., is developing an extensive placer mining enterprise at La Cienega, 45 miles southeast from Altar.

YUKON TERRITORY.

Since the finding of copper ore above Selkirk, Dawson talks of building a smelter. Whitehorse, the present terminus of the White Pass and Yukon railway, may get a smelter before Dawson.

Obituary.

CHARLES HEGARTY, a pioneer miner of Nevada county, Cal., died at Nevada on the 25th.

ALLAN G. CAMPBELL, a widely known Utah mining man, died at Riverside, Cal., of pneumonia, on the 18th inst.

CHAS. D. POSTON, prominent in Arizona mining affairs and a resident of Arizona since 1854, died at Phœnix on the 24th inst.

Trade Treatise.

Wire Rope: Macomber & Whyte Rope Co., 19–21 So. Canal St., Chicago; factories, Coal City, Ill.; 3½x6, 60 pages, paper. Illustrating and describing haulage and hoisting rope, depicting construction and showing uses; neat and condensed information on that and kindred appliances, with illustrated directions in detail for splicing. The Hallidie wire rope tramway and the Harkes safety gate also receive attention in the booklet.

Commercial Paragraphs.

THE Tom Boy Gold Mines, Pandora, Colo., are being equipped throughout for electrical power distribution. A recent purchase from the Westinghouse Electric & Mfg. Co. includes a number of induction motors, reducing transformers, low-equivalent lightning arresters with choke coils and high-tension circuit breakers.

Personal.

CHAS. BUTTERS has gone to London.

E. G. STOIBER is in Yellowstone Park.

D. G. JEWETT will have charge of the Victor, Arizona, mill.

C. F. CHAPIN is manager Montana G. M. Co. at Princeton, Mont.

F. KLEPETKO has returned from Salt Lake, Utah, to Butte, Mont.

J. M. CALDON is examining mining property at Lake City, Colo.

E. RICKARD of Denver is in San Francisco en route to Alaska.

F. RICHMOND, of the Salt Lake Hardware Co., is in San Francisco.

HERMAN WITTEBORG is superintendent Breckenridge, Colo., sampler.

J. H. MCCORMICK is appointed mill superintendent Gilt Edge, Montana.

A. F. LEVITT, of Placerville, Cal., is examining mining property in Mexico.

H. K. WHEELER has returned to Los Angeles, Cal., from Kingman, Arizona.

F. A. FARNUM, a Berlin, Nevada, mining superintendent, is in San Francisco.

F. D. BROWN is manager Sunrise group, on Flint creek, Granite county, Montana.

W. RAWSON has charge of work at the Crown Point mine, near Lake City, Colo.

JAS. SHERWIN is now manager Crystal Lake cyanide plant at Lundy, Mono Co., Cal.

L. C. TRENT has gone from San Francisco to examine an Alaska mining property.

MARK MURPHY is superintendent Hoyt M. Co., Lynx creek, near Prescott, Arizona.

R. H. POSTLETHWAITE has returned from Trinity Center, Cal., to San Francisco.

B. L. THANE goes from Berkeley, Cal., as superintendent Ebner mines, Juneau, Alaska.

J. P. POLIN is assistant superintendent Grand Central mine, Minas Prietas, Sonora, Mexico.

H. V. WALLACE is general manager Chanate group of mines, Veta Grande, Sonora, Mexico.

J. W. SIMPSON is general manager Kansas City & Sonora M. Co, Gabilan, Sonora, Mexico.

F. BOLSINGER is in charge of the new rapid-drop 25-stamp mill, Nevada Gulch, Gilpin Co, Colo.

E. H. BROWNE is elected consulting engineer Globe C. M. Co., 22 miles west of Cheyenne, Wyo.

GEO. W. KIMBLE has returned to Placerville, Cal., from a trip through Idaho and Montana.

MANAGER H. N. BOTSFORD, Wallapai M. Co., has returned to Chloride, Arizona, from San Francisco.

H. A. SHIPMAN will remain as general manager Stratton's Independence mine, Cripple Creek, Colo.

A. A. BROWN, president Mammoth Tunnel Co, has returned to Silverton, Colo., from the East.

GEO. MCCORNICK has gone from Salt Lake City, Utah, to the Jingo mines, Mountain Home, Idaho.

L. IRVINE, Supt. Plumbago, Cal., mills, is visiting Thousand Islands, N. Y., after an absence of fifty years.

WM. MCKINLEY has returned to San Francisco from an inspection of White Pine Co., Nevada, mines.

H. J. RANGER, furnace foreman Keswick, Cal., goes to Rio Tinto, Spain, to take similar charge there.

L. W. HILL has been elected president of the Spokane and Northern railway to succeed N. HILL, resigned.

R. J. MCCARTULY succeeds H. Starkweather as Supt. North Star mine, Sultan Mountain, near Silverton, Colo.

J. R. SEARS, former Supt. Arbona M. Co., Tuolumne county, Cal., has charge of the Dayton, Nev., mining property.

G. J. SIELAFF, of Virginia, Nev., goes to Costa Rica to take charge of a cyanide plant for a Boston mining company.

S. B. HARRIS, superintendent Quincy mine, Houghton, Mich., has resigned. His successor is his son, J. L. Harris.

G. B. WARREN, late of the Palace Hotel, San Francisco, Cal., has gone to Nome to oversee his mining interests there.

W. E. PASMORE, of Idaho Springs, Colo., has been appointed secretary State Mine Managers' Association, vice Dr. Coltman, resigned.

W. M. JAMES, former superintendent Sierra Buttes mine, Sierra City, Cal., expects to return to the United States from South Africa shortly.

S. B. ELBERT has gone to Rollinsville, Colo., where he will have charge of the business of the N. Colorado Ex. Co. and the G. Dirt M. & S. Co.

H. W. MCCRAY has resigned as engineer for the Kern, Cal., L. and W. Co. He is employed by the Southern Pacific Co. as manager of fuel and oil supplies.

PERCEY SHARPE is now general manager of El Verde Grande Copper Co., Magdalena district, 14 miles from Imuris, on the Sonora, Mexico, railroad.

C. A. LAWSON, of the J. Geo. Leyner Drill Co., has returned from San Francisco to Denver. J. H. Sanborn will represent the company in California.

W. H. LINNEY, superintendent DeLamar mines, DeLamar, Nevada, has returned there from Salt Lake City, Utah. He will continue under the new ownership.

T. H. OXNAM has resigned his position as general manager Palmarejo and Mexican Gold Fields, Ltd., on account of ill health. Mr. Oxnam is now at Avalon, Cal.

MESSRS. WILHELM AND HIBY, the former mining engineer for the German Government and the latter representing the Hilkenstock coke industry, are examining Utah mines.

WILLIAM Y. WILLIAMS, superintendent Granby mines, B. C., accompanied by the company's resident engineer, O. B. Smith, Jr., is visiting the Treadwell mine, Douglas island, Alaska.

J. R. BIBBINS has resigned as assistant electrical engineer of the Detroit United Railway to accept a position in the Westinghouse Companies' Publishing Department, Pittsburg and New York.

H. HEFFRON has resigned the management of the Sierra Pinta M. Co., Altar, Sonora, Mexico, and has been succeeded by E. Holland, proprietor of the mines at Quitovac, 7 miles from Sierra Pinta. Mr. Heffron will shortly return to California.

ON the 11th inst., Columbia University conferred the honorary degree of Doctor of Science on Prof. Samuel Benedict Christy, professor of mining and metallurgy, and dean of the faculty of the College of Mining of the University of California.

G. A. RICHARDS, manager Mt. Morgan, Australia, mine, who left last July on a tour, has returned, and complacently tells his local paper that "we in Australia are ahead of the Americans in regard to gold mines." He is also of the opinion that "we are in advance of them in the treatment of refractory ores; and if ever they get deep mines like Ballarat, they will have to go there to learn that business."

Latest Market Reports.

SAN FRANCISCO, June 27, 1902.

METALS.

SILVER.—Per oz., Troy: London, 24½d (standard ounce, 925 fine); New York, bar silver, 52¾c, refined (1000 fine); San Francisco, 53c; Mexican dollars, 44½c San Francisco, 42½c New York.

COPPER.—New York: Standard, $11.50@11.80; Lake, 1 to 3 casks, $12.25; carload lots, $12.00; Electrolytic, 1 to 3 casks, $12.00; carload lots, $11.75; Casting, 1 to 3 casks, $12.00; carload lots, $11.00. San Francisco: $14 00. Mill copper plates, $17.00; bars, 18@24c. London: £52 17s 6d spot, per ton.

LEAD.—New York, $4.12½; Salt Lake City, $3.60; St. Louis, $4.00; San Francisco $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, $4.75. London: £11 2s 6d per ton.

SPELTER.—New York, $4.87; St. Louis, $4.50; London, £18 12s 6d per ton; San Francisco, ton lots, 5¾c: 100-lb lots, 6¼c.

ANTIMONY.—New York, Cookson's, 10c; Hallett's, 8¼c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, $28.50: San Francisco, ton lots, 31½c; 1000 lbs., 31¾c; 500 lbs., 31¾c; 200 lbs., 32c; less, 32½c; bar tin, ℔ lb, 37½c.

PLATINUM.—San Francisco, crude, $17.50 ℔ oz.; New York, $19.50 per Troy oz

QUICKSILVER.—New York, $48.00 large lots; London, £8 15s; San Francisco, local, $46.00 ℔ flask of 76½ lbs.; Denver, $50.50. Export, $43.50.

BABBITT METAL.—San Francisco, No. 1, 10c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16½c.

NICKEL.—New York, 50@60c ℔ lb.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $20.50; gray forge, $20.00; San Francisco, bar, 2.75 ℔ lb.,3c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $33;34; open hearth billets, $35.00; San Francisco, har, 7c to 12c per lb.

CEMENT.—Germania, $2.65; K. B. & S., $2.65; Hewmoor, $2.50; Trowell, $2.50 per bbl.

LIME.—Santa Cruz, $1.60; Roche Harbor, $1 60 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, $18.00@19 50; extra sizes higher; redwood, $19.00@20.00; lath, 4 feet, $3.90 @4.00; pickets, $19.00; shingles, $2.00 for No. 1 and $1.75 for No. 2; shakes, $13.00 for split and $14.00 for sawed; rustic, $25.00 @31.00.

GENERAL SUPPLIES.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.50; Cut, $3.50; 10d to 16d, Wire, $3.55; Cut, $3.55; 8d, Wire, $3.60; Cut, $3.60; 6d and 7d, Wire, $3.70; Cut, $3.70; 4d and 5d, Wire, $3.80; Cut, $3.80; 3d, Wire, $3.95; Cut, $3.95; 2d. Wire, $4.20; Cut, $4.20. Special rates for carload lots.

POWDER.—F. o. b. San Francisco: No. 1. 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c ℔ set; 14 oz., 40s., 9c.

COAL.—San Francisco, coast, yard prices: Wellington, $9; Seattle, $6.50; Coos Bay, $5.50; Southfield, $9.00. Cargo lots, Eastern and foreign: Wallsend, $8.00; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8; Cumberland, $12; Cannel, $9.50; Welsh Anthracite, $12.00; Rock Springs, $9.56, long ton; Colorado Anthracite, $14.00. Coke, $15 per ton in bulk, $17 in sacks; Sunnyside, $11.75, long ton.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 27@28c ℔ lb.; carloads, 25@26c; in 10-lb. tins, 38c; sulphuric acid, in carboys, 66° B, 2c ℔ lb.; soda ash, $1.90 ℔ 100 lbs.; hyposulphite of soda, 2¾@3c ℔ lb.; blue vitriol, 5¾@6¼c ℔ lb.; borax, concentrated, 7@8c ℔ lb.; chlorate of potash, 12@13c; roll sulphur, 5c; alum, $2.00@2.25; flour sulphur, French, 2¼@2½c; California refined, 1¾@2c; nitric acid, in carboys, 8c ℔ lb.; caustic soda, in drums, 3@4c ℔ lb.; Cal. s. soda, bbls., $1.25 @1.50 ℔ 100 lbs.; sks, $1.05; chloride of lime, spot, $2.50@2.60; nitrate of potash, in bbls, 8c: caustic potash, 10c in 40-lb. tins.

OILS.—Linseed, boiled, bbl., 73c; cs., 78c; raw, bbl., 71c; cs., 76c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 64c; cs, 70c; raw, bbl., 62c; cs, 67c. Kerosene—Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 25c; Elaine, 22c; Water White, in bulk, 13½c; Mineral Seal, iron bbls., 19c; wooden bbls., 22½c; cs, 25c; Mineral Sperm, cs, 26½c; Deodorized Stove Gasoline, bulk, 16c; do., cs., 21½c; 86° Gasoline, bulk, 20c; do., cs., 26½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 14½c: do., in cs., 21c; Lard Oil, No. 1 bbl., 60c; cs., 65c; Neatsfoot Oil, hbl., 70c; cs., 75c; No. 1 bbl., 52½@55c; cs., 57½@60c; Sperm, crude, 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6½c; 1 ton and less than 5 tons, per lb., 6¾c; 500 lbs. and less than 1 ton, per lb, 7c; less than 500 lbs., per lb, 7¼c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6c; do. in kegs, 6¾c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb., 7c; 500 lbs. and less than 1 ton, per lb., 7¼c; less than 500 lbs., 7¾c.

ASSAY LITHARGE.—Per lb, 8½c.

BISMUTH.—Subnitrate, per lb., $1.60.

BONE ASH.—4c ℔ lb.

BORAX.—Crystal, 7c: calcined, 25c.

CHROMIUM.—(90% and over) per lb., $1.25.

COPPER.—Carbonate, 20c; Red oxide, ℔ lb., 60c.

MAGNESIUM.—Per lb., $3.00.

MANGANESE.—(90% and over) ℔ lb., $1.25.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—25c. ℔ gramme; 1000 grammes=2¼ lbs.

PHOSPHORUS.—(American) ℔ lb., 80c.

SILVER.—Chloride, ℔ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.00.

URANIUM.—Oxide, ℔ lb., $3 50.

ZINC.—Metallic, chemically pure, ℔ lb., 50c.

ZINC.—Dust, ℔ lb. 10c.

ZINC.—Sulphate, ℔ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

SIX YEARS' CONSTANT WEAR WITHOUT A BREAK.

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JAS. S. BROWNELL, San Francieco, Cal.—DEAR SIR: THE EMPIRE MINES, GRASS VALLEY, NEVADA CO., CAL., Jnn. 29, 1901.

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JAS. S. BROWNELL, San Francisco, Cal.—DEAR SIR: PIONEER-LYNN MINING COMPANY, TOWLE, PLACER CO., CAL., Jnn. 12, 1901.

The eigbt "Patent Lip" flange helte purchased from you in December, 1895, have been in constant uee in tbe mill since that time, and have given the best of eatisfaction, and bave proved to be far euperior to the old plain flange belt wbicb we were ueing. The helte now in uee ehow bardly any wear, nnd eeem to be in ae good condition as wben firet put on tbe machines; one thing, they do not ehow nny tendenoy to orack nlong the edge of the belt. Youre truly, JERRY SULLIVAN, Superintendent.

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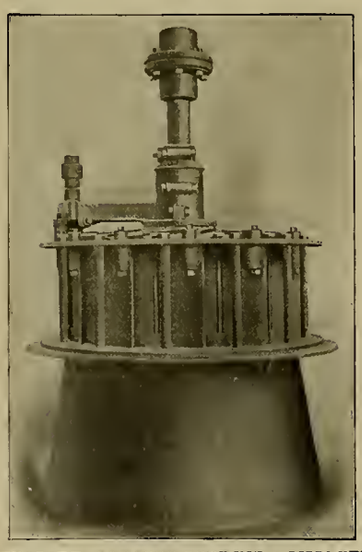

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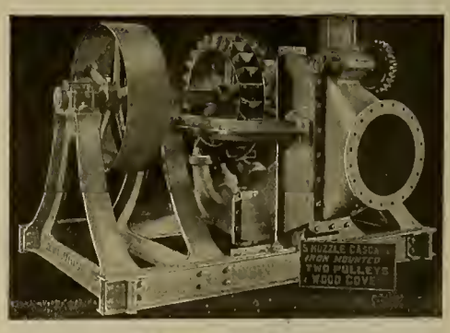
State the amount of water you have available, the fall or head, and the work it is desired to do, and we will be pleased to furnish specifications and quote prices on complete Water Power Plant or for any part thereof.



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